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DEUTSCHER Export

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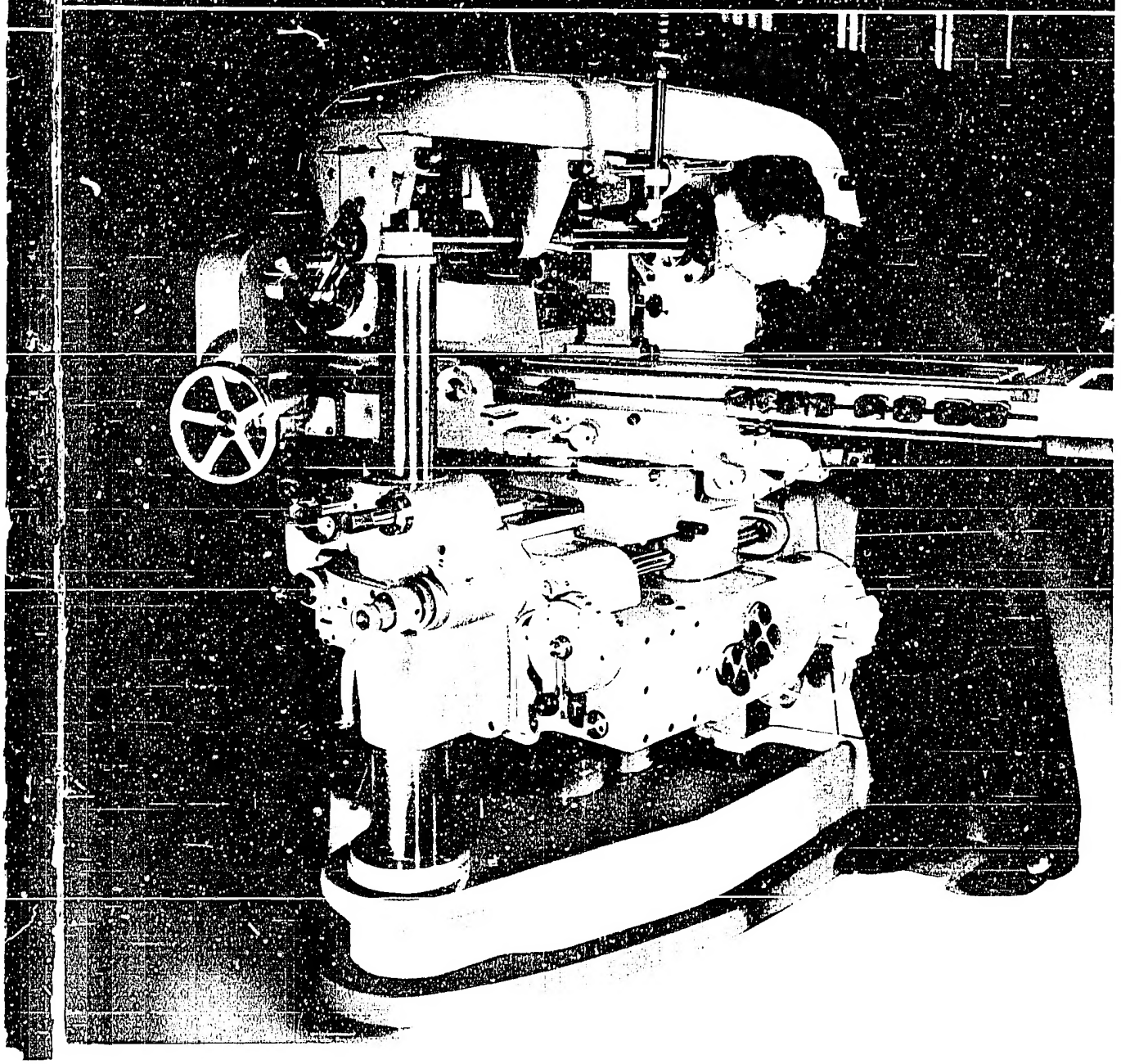

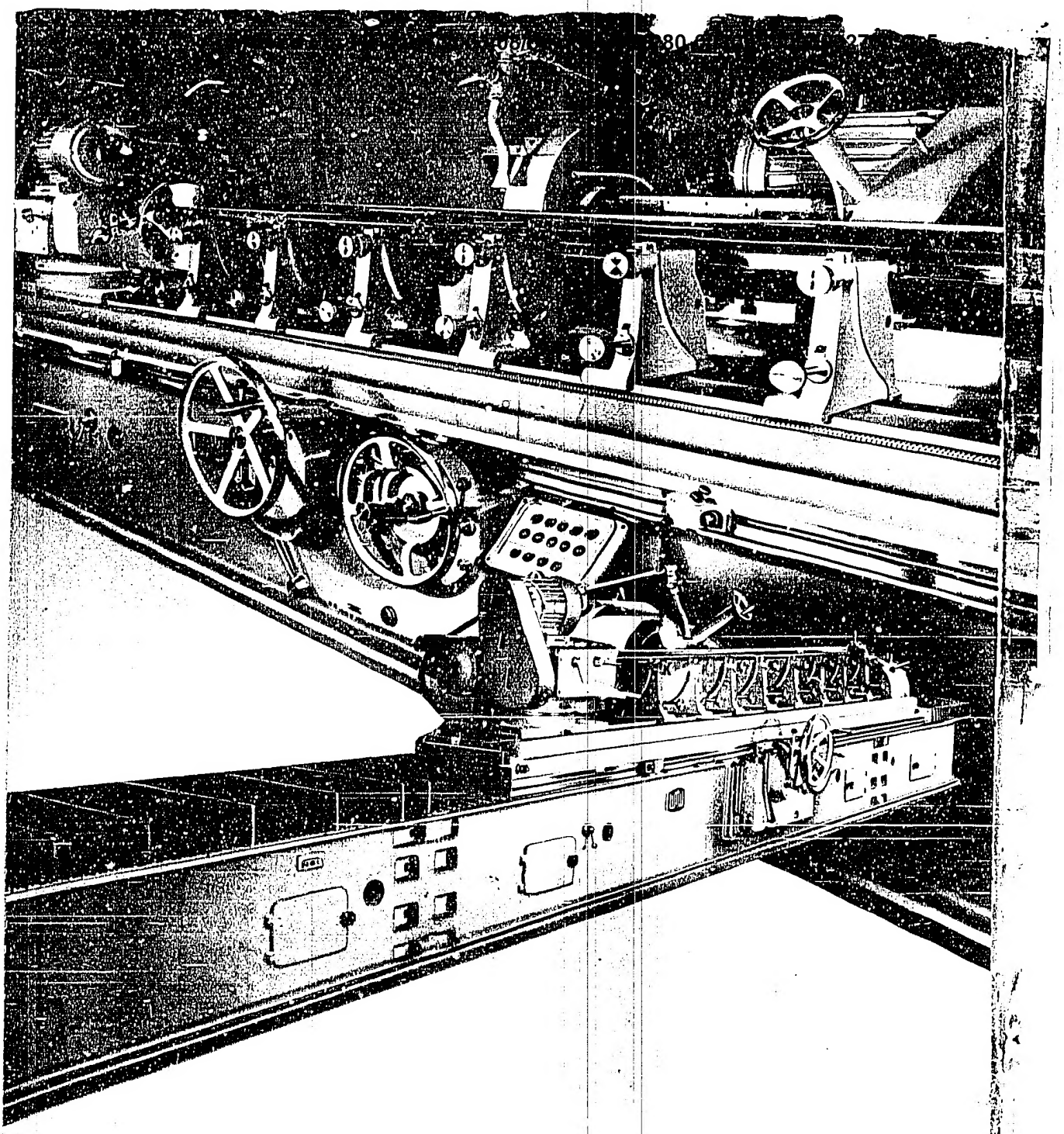

Circular Grinding Machines

Revolving diameter 150-800 mm · Grinding length 700-8000 mm

DEUTSCHER Export

Machine tools • February 1953

CONTENTS

OUR PICTURE ON TITLE-COVER:
Universal milling machine model FU

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HIGH-EFFICIENCY MACHINE TOOLS

The organic development of our economy under the Five-Year Plan, and the planned increase of our industrial production to nearly double the volume of 1950, has laid a particularly heavy responsibility on the machine tool industry of the German Democratic Republic. In the initial period after 1945 we were mainly concerned with the development and construction of universal and multi-purpose machine tools, to enable our industries to start with their manifold manufacturing programmes. In recent years, however, the makers of machine tools have specialized in the manufacture of single-purpose and special machine tools. It is a proof of the growing economic strength of the German Democratic Republic and her rapidly increasing potential, particularly in the machine tool sector, that it could gradually take to serial manufacture of special machine-tools. The industry is, nevertheless, able and willing at any time to meet requirements for special constructions.

The vast national construction programme under the Five-Year Plan, which includes the erection of large power stations, rolling mills, and large mining enterprises, calls for heavy-duty machine tools for the working of super-sized pieces. As early as 1951 there was developed a turning mill with a turning diameter of 10,000 mm., the outstanding feature of which was the combined steel and concrete construction applied for the first time.

The fulfilment of the energy plan calls for the construction of heavy-duty planing machines with a planing width of 4,250 mm., large lathes with a turning diameter of 3,200 mm., and a turning length of 10,000 mm., as well as rotor spline milling machines with a maximum distance between the dividing heads of 8,000 mm., and chucking facilities of the face plates between 160 and 10,000 mm.

Of special attraction at the Leipzig Fair in the spring of 1952 was a copying milling machine that permits the fully automatic duplication of pieces 4,500 mm. long, 2,000 mm. wide and 700 mm. deep.

With all these new developments the guiding idea of the designing engineers has been to eliminate as much as possible physical exertion of the operator and to introduce automatic performance wherever possible. This task they were able to solve with unusual success because, at every designing stage, they proceeded only in close consultation with their fellow workers in the shops.

The close co-operation of the scientific research institutes, with the works engineers and the operators in the shops, affords our industry the unique possibility to attain the peak of efficiency in constructional and works techniques.

Our friendship with the Soviet Union and the nations of the People's Democracies has proved particularly fertile in the economic sector and the interchange of technical experience and scientific research data. Thus we were given the full benefit of the advanced techniques and work-bench experiences of the Soviet Union. The application of Soviet techniques, as for instance the high-speed metal turning method of the master-turner Pavel Bykov, has enabled us to strain the efficiency of these particular machine tools to the utmost limit of their capacity and to effect a degree of economy which reputed technologists would never have believed possible. Through the adoption of these advanced techniques, which in no way add to the physical charge of the worker, but, on the contrary, mean a substantial relief, our industry has attained an unprecedented productivity of work. Increased productivity of work means saving of manhours and lowering of costs. Proof of this are the absolutely competitive prices of our machine tools.

The quality of our machine tools is further guaranteed by the desire of our workers, technicians and engineers to collaborate and contribute towards the success of

our great economic plans, the benefit of which goes to the community. They are, therefore, united in a common pledge to solve the problems put before them and to fully satisfy the customer with respect to quality workmanship and production capacity.

The manufacturing plants of our machine tool building industries unite their decades of experience with the knowledge gained through research work and the progressive working methods which have emerged under the leadership of our activists and works brigades, our inventors and National Prize holders. This is the basis for the delivery of quality products.

The endeavours of our industry to satisfy every wish of our foreign customers, including the most specialized designs, have the full support of the economic and commercial policy of our government. The Leipzig Autumn Fair in 1952 emphatically showed the readiness of the Government of the German Democratic Republic to promote and to widen the exchange of goods on an equal basis with all countries.

The rich display of our industry's goods at the Fair showed an allround improvement of quality, which not only aroused the interest of every foreign visitor, but induced export and import sales, which far exceeded those of the Fairs of the last two years.

Long-term commercial treaties and agreements with the Soviet Union, the countries of the People's Democracies, Poland, Hungary, Rumania, Czechoslovakia, Albania, and the People's Republic of China, ensure our supply of raw materials for years to come, and facilitate balanced planning of our production for satisfactory quality and delivery.

This is also the cause for the increased sales with the representatives of those countries with which we have signed agreements regarding the mutual exchange of goods and the mode of payment, or with which the commercial intercourse is settled by means of general barter agreements , banking agreements, or direct cash payments.

These very sales are a proof of the fact that the Leipzig Fair in 1952 substantially contributed to the development of a broad international commerce, and especially between countries of different economic systems.

The increase by 192.3 per cent of our industrial production through the success of our Two-Year Plan, and the increase of our agricultural produce during the present course of the Five-Year Plan will make it possible by 1955 to increase our foreign trade to 290 per cent above that of the year 1950.

The outstanding success of our economy during the past years proves the wisdom of our economic planning, and encourages us to continue the same path and to begin with the construction of Socialism. This means a constant rise in the standard of living of our society, the realisation of all technical possibilities and developments for the reconstruction of our industry and, last but not least, the delivery of first-quality industrial products according to terms agreed upon with our foreign customers.

The fact that our economy is free from the risk of crises is a guarantee for our partners in trade, who wish to do business on a mutual basis, that — owing to the ever-increasing demands for commodities within our own population—a market is open to them, which is also ready to receive the products of their own countries.

The German Democratic Republic offers high-quality machines and equipment, products of the electrotechnical and optical industries, valuable chemicals, and other high-quality goods, and has a growing capacity for buying foodstuffs, industrial and chemical raw materials, industrial products, as well as semi-finished products, special machines, textiles, and leather goods.

Thus the German Democratic Republic, through her foreign trade policies, already shows her desire to serve the cause of Peace through friendly trade relations on a mutual basis with all countries.

The Leipzig Fair – a Bridge to World Trade

During the International Economic Conference in Moscow in April last year the Soviet Union declared her readiness to increase her trade with countries of other economic systems by 30 to 40 thousand million roubles within the next two or three years. The European countries of the People's Democracies were willing to increase their trade up to 25 to 30 thousand million roubles, the People's Republic of China from 15 to 19 thousand million roubles, and the German Democratic Republic from 10 to 12 thousand million roubles.

The Leipzig Fair, with its vast exhibitions, documented the capacities of these countries as sellers as well as customers.

Foremost was the Soviet pavilion, two thirds of which were filled with the products of the Soviet heavy-machine building industry, evidence of the rapid development of Soviet economy.

Among the 30 models of metal turning machine tools, there were certain new designs which were the topic of the day for all experts. Of particular interest to visitors was the semi-automatic gear grinding machine, the gigantic vertical turning and boring mill, and the threading lathe model 164. The output, as against the 1951 models of these machines, is now greatly surpassed.

The 17 types of passenger-cars and trucks—especially the 25-ton model—and the eight types of tractors, displayed the high standard of motorisation in the U.S.S.R., which is now well up in the front ranks in international vehicle building.

The same may be said of Soviet agricultural engineering which has doubtlessly taken world lead. Let us cite examples such as the tractors "Byeloruss", or "MTS-1" which perform all operations for grain and other cultures, also the gardening tractor, turnip and potato-hoeing machines, flax and cotton harvesting machines, the fully motorised combine "Stalinez-6", with a daily capacity of 20 to 25 hectare, the 10-metre grass mower with a daily capacity of 60 hectare, and the five-share ploughing tractor. All these machines which are so valuable for the cultivation of large agricultural areas, are unparalleled throughout the world.

Considerable floor space of the exhibition was required for electrical and radio measuring instruments. Much attention was attracted by an 8-loop type oscillograph model MPO-2 which permits taking up at one time eight fluctuating pictures on a film 35 mm. broad. The film has a velocity of 1 to 5,000 mm. per second. The ferrodynamic recording amperemeters exhibited, and recording voltmeters with three velocities 20, 60, and 120 mm. for the paper movement possess a very high degree of precision.

Amongst the chemical products of the Soviet Union multi-coloured blocks made of synthetic resin "Polystyrol" for the manufacture of the most various mass products were offered for the first time. These and other chemical products, like four-colour amino plastics, black and brown phenoplastics, aniline colours in various tints, ferrocyanide and dioxide of titanium, are now part of normal production in the Soviet Union.

The Soviet offer of mining products was also extensive: iron ores, manganese, chromium, and asbestos of a very high quality.

Also exhibited were precious stones from the Ural Mountains, such as sapphires and rubies, and valuable woods from the Caucasus, Siberia and the northerly districts of the Soviet Union.

Also shown were new Soviet petroleum and naphta products with new admixtures intended to heighten the quality and constancy of the oil.

The fishing and foodstuffs industries of the Soviet Union exhibited high-quality preserves.

The general impression of the Soviet capacities for production and delivery was completed by the display of new medical apparatuses, office and accounting machines, electric refrigerators, and a rich assortment of mass-products made of glass, ceramics, textiles, and leather, together with the products of the Soviet popular arts.

The People's Democracy of Hungary was represented in Leipzig by an extensive and comprehensive exhibition, and each Hungarian export trade enterprise had a rich assortment of articles on show. The products exhibited in Leipzig characterized the outstanding

industrial and trade efficiency of Hungary, beginning with the heavy industry—and particularly with the leading products of the machine tool building—down to the light industries, the foodstuffs industry, etc.

There were heavy radials weighing several tons which, despite their huge weight, excelled through their ease of operation and high precision of work. Horizontal and vertical milling machines, lathes, cold saws and plate shears stood out as new designs on a high level of engineering. They also found many buyers during the Fair. Omnibuses having a "self-bearing" body, motor-cycles with well-proportioned exteriors and a careful finish, excelling in their high efficiency, and motor-lorries with new designs of the Hungarian automotive industry, all met with the interest of visitors from this country and abroad.

The world-renowned Hungarian foodstuffs were displayed in the same tasteful manner as the products of the Hungarian textile and leather industries.

More than 2,000 objects were exhibited by the export trade companies of the People's Republic of Bulgaria. The exhibitions of drilling and milling machines, the air compressed hammers, the lathes and high speed lathes, shaping machines and Diesel engines proved, together with the exhibits of the Bulgarian electrical industry, that Bulgaria has developed from an agrarian country into a modern industrial nation.

A large part of the Bulgarian stands showed building materials and chemicals.

As products of the light industry, textiles and leather goods were offered. Also on display was the Bulgarian tobacco industry, the foodstuffs industry, and the cosmetics industry with their world-famed attar of roses.

Bulgarian handicraft furthermore offered noteworthy embroideries and national costumes, ingenious poker-work and other carved work, ceramics, and leather goods.

There was good reason for the general surprise caused by the exhibition of the People's Republic of China. Here for the first time in Europe the products of the young Chinese machine building industry were offered. Lathes, drilling machines, milling machines, universal grinding machines, as well as textile machines, printing machines, power generating plants, and woodworking machines were among the many products which proved the enormous changes which have been wrought in the economic structure of China since the foundation of the People's Republic.

There was an extensive show of industrial raw materials and of the famous domestic products, such as the world-famous Chinese silks, carpet satins, Hunan embroideries, wool and cotton goods, etc.

Of the greatest interest were China's world-renowned mineral treasures like antimony, bauxit, manganese, magnesium and others which China offers to her partners in trade.

Products of the arts and crafts, surgical instruments, medicines, leather goods and furs, and a great many foods, including tea, cigarettes, etc., completed the picture of the efficiency and export facilities of the People's Republic of China.

The Rumanian People's Republic exhibited machine tools, precision instruments, equipment for the petroleum industry, tractors, and precision ball bearings.

Building materials and glassware, electrotechnical and agricultural implements, silverware, shoes, toys, hides, and furs completed the comprehensive offer in goods of all kinds from the Rumanian People's Republic.

Symbolic of the new economic strength of the People's Republic of Poland was the huge double column vertical turning and boring mill, a gear rim 3 metres high, several plate rolls and section rolls, and other goods of the heavy and light industries.

The Czechoslovakian industry exhibited in Leipzig up-to-date shop equipment and machines for transport and for energy plants. Amongst others could be seen steam turbines with a power up to 55,000 kW, and large synchronous motors for a power up to 15,000 kW. These were followed up by equipment for the mining industry and for metallurgy. The machine tool building industry exhibited amongst others lathes having a length of 32 metres and a weight up to 130 tons for machining workpieces with a weight up to 120 tons and a circumference of 2,500 mm.

Textiles and shoes, musical instruments, glassware and jewellery, porcelain, as well as hop, malt, beer, sweets and other products of the foodstuffs industry were offered, ready for sale to countries of all economic systems.

Together with the offer of goods of the German Democratic Republic, the 1952 Leipzig Fair has proved that the perspectives held out by the International Economic Conference in Moscow with regard to an enlargement of world trade have a very real economic basis, and that the Leipzig Fair is par excellence an important mediator for world trade.

Pavel Bykov exchanges experiences with our great master turners Erich Wirth and Kurt Reichel

New methods for super-speed metal removing are adding to the development of our machine tools

An essential part of the knowledge about the design and construction of modern maximum capacity machine tools is based upon high-speed cutting property for turning, milling, planing, reaming, or other cutting operations. As a source of the economical development which the modern machine tool building has derived from scientifical research and from practice we have to look upon our working people in the manufacturing plants whose new ethic of work is the starting-point for this new path towards development. The valuable experiences upon which our work could be erected are due to the collaboration with the innovators of the Soviet Union, to the personal exchange of experiences occasioned by Pavel Bykov's visit to our manufacturing shops, and to the exchange of ideas with the countries of the friendly People's Democracies. The collaboration of our workers with the technical intelligentsia made it possible to evaluate the new knowledge gained. It is to our activists that the merit belongs to have contributed by their own work, and in following with the Soviet methods, that super-speed metal removing has become profitable for practical machining purposes. The trend of the designer's ideas at his drawing board has been virtually influenced by them, and directly transferred to the construction of our machines.

The close connection between the machine tool and its tools — so decisive for the result of machining — has induced us that simultaneously with the modern conception incorporated in our machines, for the manufacture of the tools, too, the same trend of

development has been taken into consideration. The possibilities in the application of cemented metal carbids were oftentimes not fully utilized. The new tooling methods alone — and particularly on the field of super-speed metal removing — have caused the knowledges gained to be more generally utilised in the shop.

In developing our new designs we started from the maximum values for metal removing based upon economical principles and which constantly heighten the capacities of our products by using very high cutting speeds, advantageous cutting tool angles, utilizing in an economic manner the cutting materials, paying heed to a long service life of the tool and to a minimum of power required by the machine. These features are decisive for

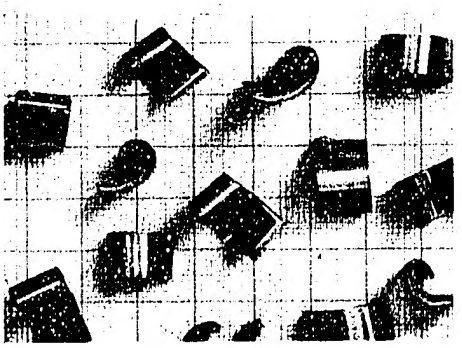
the ruggedness of general construction,
the safe chucking of both workpiece and tools,
the safe bearing arrangement of the work spindle,
an efficient gearing arrangement with advantageous spindle speed and feed ranges, and, finally,
a high driving power.

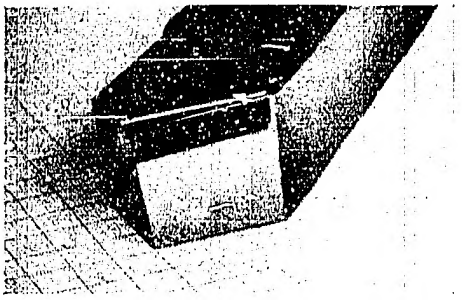
At the same time, all the other requirements expected from modern machine tools are complied with, e. g.

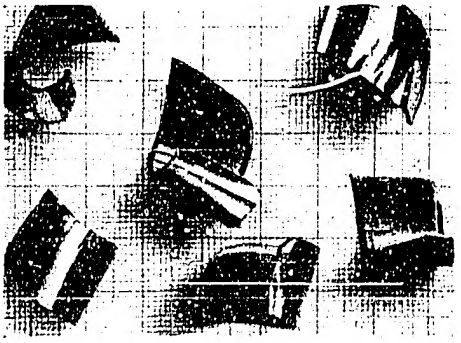
cutting down the machining times by a central arrangement of the operating elements,
eliminating of faulty controls by foolproof arrangements, extensive automatization of machining operations and controls,
an increased application of electrical and hydraulic control elements,
taking into account an unimpeded flow of chips, especially in the case of a heightened stock removal capacity,
paying particular attention to the design of those parts which are liable to wear, bearing in mind their safe accessability and interchangeability and, lastly,
paying particular heed to lubrication.

The reliability of service and absence of accidents are guarenteed by utmost precautionary measures.

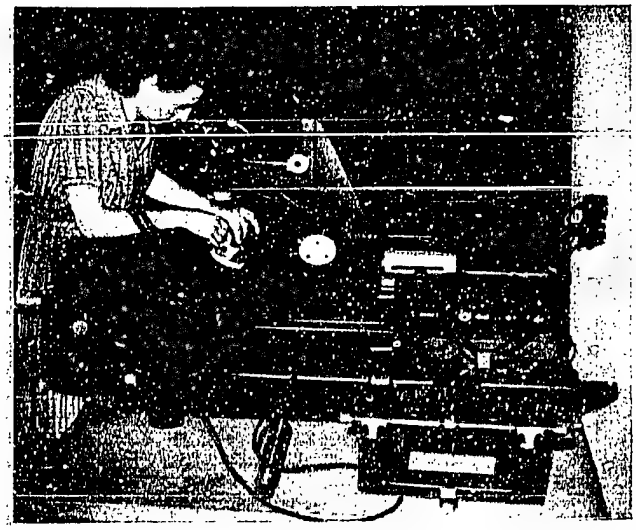
The functional quality as obtained by the first machine of such designs which are ready for pro-







Well-maintained tool cutting edges give a good chip formation and are a sign of optimal metal cutting. Discussions and an exchange of engineering practice between activists and the technical intelligentsia with regard to tests have lead to valuable successes



Testing of materials

duction is constantly being secured by a quality control founded upon the quality specifications according to professor Schlesinger and to the German DIN-standards. They are applied in a way that the interchangeability of the component parts is ensured. The field of action of the quality control begins with the inspection of the incoming materials, the checking of castings, coldpressed forgings and other pressed parts, of industrial standards and of purchased parts and accessories, the inspection of the single workpieces in the shop including the inspection after every operation up to the assembling shop. The test for efficiency and increased efficiency of the aggregates is followed up by the control of the manufacturing process up to the assembling shop for the finished product, the inspection of all functions under practical service conditions, and the drawing up of test certificates. Particular attention is paid to the carrying out of load capacity tests and the effect of the tool compared with the productive capacity of the machine required and with respect to the surface finish and to the accuracy of the finished product; furthermore to the checking of the handling times, of the safety tests against faulty control, and danger of accident, to the inspection of the system of lubrication, the flow of chips, and to the inspection of the electrical equipment.

The guarantee for a machine which answers to these demands lies not so much in the application of modern means of production and measuring instruments, but is essentially based upon personal and professional engineering qualities of our workers in the course of production. Skilled engineering faculties, sensibleness, concientiousness, reliability, an a new ethic of work, utilization of progressive operating methods, community of interests, team work and a firmly cemented social basis — all these conditions result in the necessary impulses which lead to to utmost efficiency and to cheerful work.

OPENSIDE AND DOUBLE COLUMN PLANING MACHINES

The development of the high-speed cutting tools has essentially influenced also the design of our planing machines, and has necessarily accommodated them to the high demands of the practice.

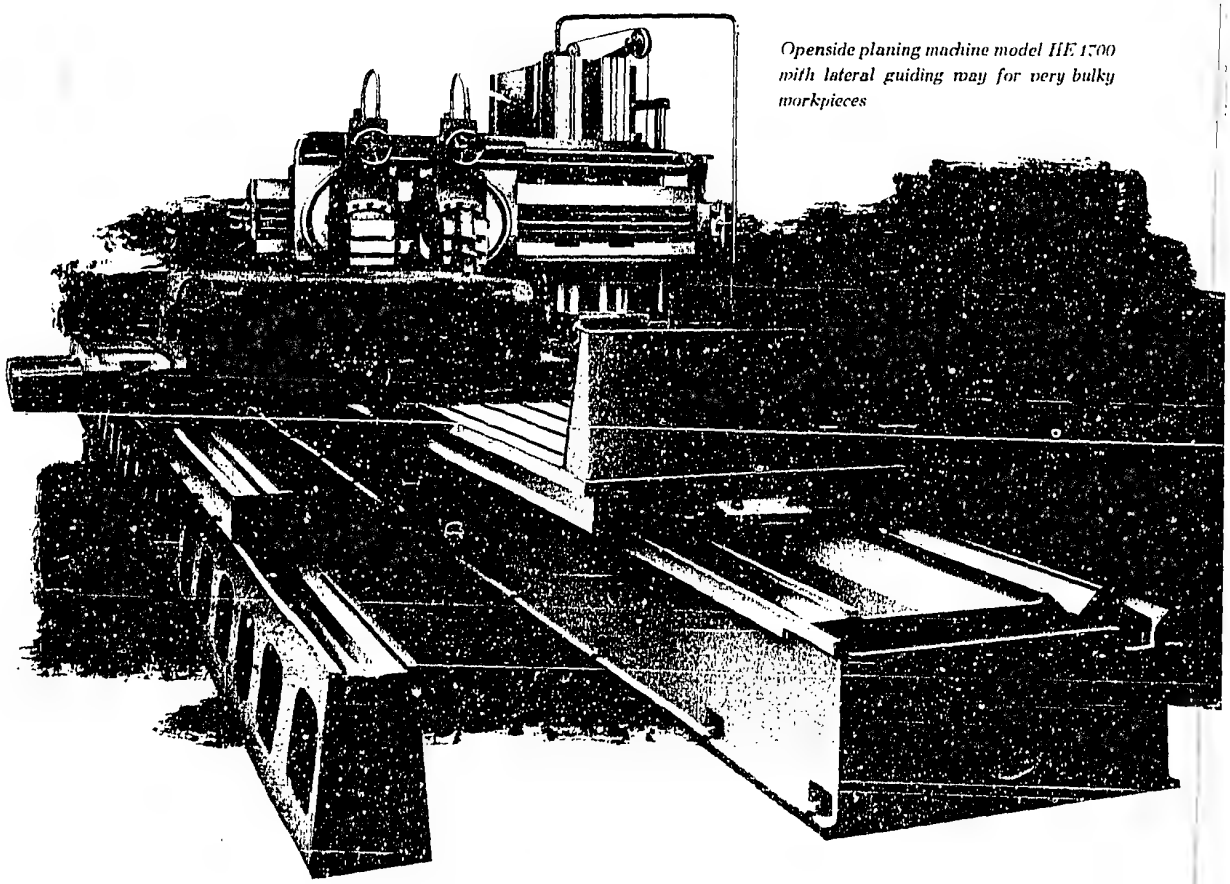
Our range of manufacture comprises openside and double column planing machines, namely

openside models HE 800 with a planing width of 800 mm and a planing length between 2000 and 4500 mm, and the models HE 1250 and HE 1700 with planing widths of 1250 and 1700 mm respectively, and planing lengths between 2500 and 12000 mm; further

double column models HZ 1250 and HZ 1400 having planing widths of 1250 and 1400 mm respectively and planing lengths between 2500 and 12000 mm, and the models HZ 1600 and HZ 1800 with 1600 and 1800 mm planing widths and planing lengths within the range of 3000 to 12000 mm.

This range of manufacture has been enlarged this year in the double column type line by the model HZ 2000 with a planing width of 2000 mm and planing lengths between 4000 and 12000 mm.

Both the openside and double column planers stand their ground according to the machining conditions required. The openside planing machine, in addition to the double column type, is on account of its accessibility on its left side indispensable for such bulky workpieces which cannot be machined by the



Openside planing machine model HE 1700 with lateral guiding way for very bulky workpieces

double column planer. The standard model is equipped with but one cross rail slide. Another cross rail slide as well as a side head, or two side heads for double column type machines, can be furnished as an extra.

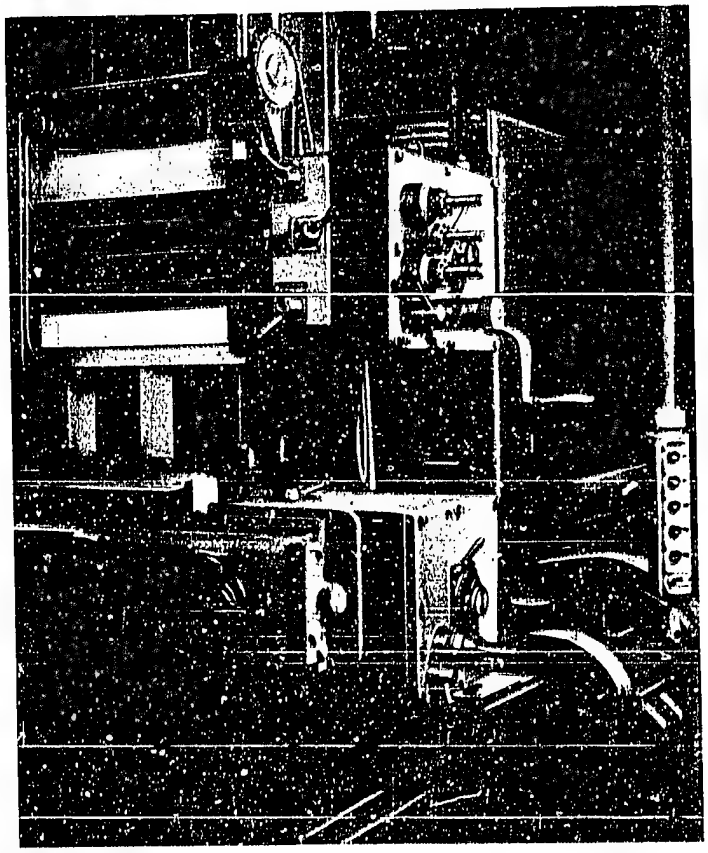
The double column planing machine is a new design and provided for the utilization of carbide-tipped tools. This results above all from th available speeds for the cutting stroke (8 to 63 m/min). The speed for the reverse traverse is variable between 16 and 85 m/min. The pulling power amounts to 16000 kg for speeds up to 25 m/min. Great store has been set in the design of the machine to the ease of operation and maintenance, to a variety of clamping facilities for the works, to the high bearing capacity of the bed and of the table with a low surface pressure upon the ways, to a vibrationless construction of the bed, table, columns, cross rail, top traverse, and heads, and to reliable reverse motion and control mechanisms. By means of the rugged construction of the machine, and owing to the high table speeds for the working and return travels and to an extensive application of stepless feeds, high metal removing capacities for roughing and finishing operations are attained.

Openside planing machines

Chief dimensions	
planing width in	
planing height	
table width	
planing length	
cutting speeds	
return travel speeds	

Double column planing machines

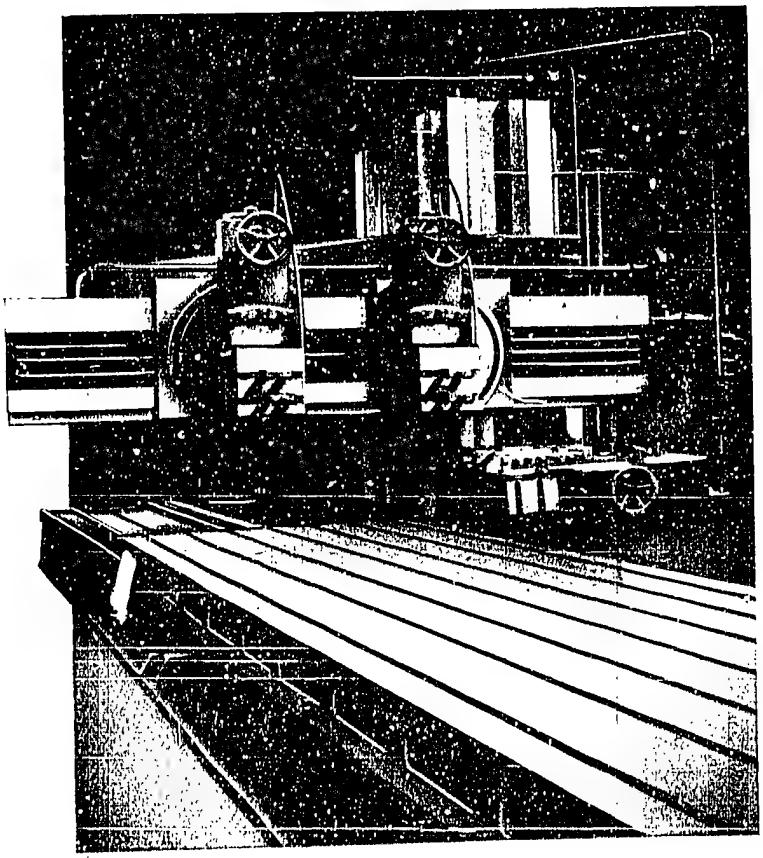
Chief dimensions	
planing width	
planing height	
table width	
planing length	
cutting speeds	
return travel speeds in	



Double column planing machine HZ 1600 R.H. operating side with R.H. side head on R.H. column

model HE 800 × 2000 to 4500	model HE 1250 × 2500 to 12000	model HE 1700 × 3000 to 12000
mm 800	1250	1700
mm 630	1000	1250
mm 710	1120	1400
mm 2000—4500	2500 to 12000	3000 to 12000
m/min 10—13—16—21—25—33	8—10—12,5—16—20—25—31,4—40—50	
m/min 30 and 40	16—31,5—63	

model HZ 1250 × 2500 to 12000	model HZ 1400 × 2500 to 12000	model HZ 1600 × 3000 to 12000	model HZ 1800 × 3000 to 12000	model HZ 2000 × 4000 to 12000
mm 1250	1400	1600	1800	2000
mm 1250	1250	1600	1600	2000
mm 1120	1250	1400	1600	1800
mm 2500 to 12000	2500 to 12000	3000 to 12000	3000 to 12000	4000 to 12000
m/min 8—10—12,5—16—20—25—31,5—40—50			(with reservation) 8—10—12,5—16—20—25—31,5—40—50—63	
m/min 16—31,5—63				16—25—36—56—85



Openside planing machine HE 1250

NEWLY-DEVELOPED HYDRAULIC VERTICAL SLOTTING MACHINES

STANDARDIZATION AND APPLICATION OF CONSTRUCTIONAL UNITS

The application of mechanical, hydraulic and electrical driving elements has to a high degree contributed to the development of a production machine with an all-round efficiency regarding its output, function, and attendance. A good deal of slotting operations, such like the cutting of gears and keyways, require a high cutting power from the slotting machines, the tools of which are to a certain extent of the broaching type. The tool working at times at a considerable distance from the ram guide, the machine must needs be of a heavy and very sturdy construction. By combining the above mentioned mechanical, hydraulic and electrical driving elements, it is essential to choose the most efficient driving means for the main control and other subordinate motions, so as to develop a machine which

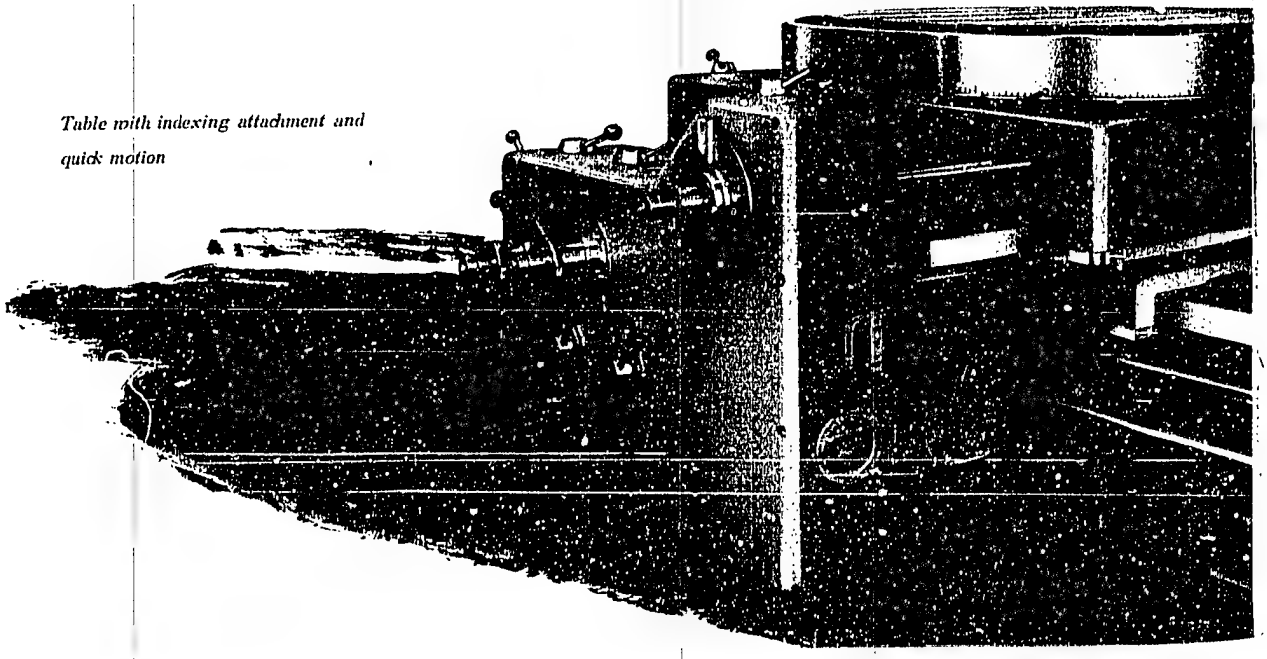
has a high cutting capacity and working accuracy,

possesses a precise control of both ram and feeds,

is easily to be operated and attended to, and

answers to all shop demands regarding an utmost economic utility, foolproof operation and reliability in service.

A combing out and simplification of our range of constructional designs has been intended and carefully worked out parallel with the above described and newly-developed hydraulic type vertical slotting machine. As a result of this standardization, our range of manufacture has been restricted to 3 types, the cutting strokes of which as well as cutting speeds, feeds and chief dimensions show a geometrical progression according to German standards DIN 323. The models 710, 1000 and 1400 denote that the maximum cutting strokes are 710, 1000 and 1400 mm respectively for external slotting operations, the corresponding cutting strokes for internal slotting operations amounting to the half of that value. In order to avoid the necessity of manufacturing driving pumps, controls, valves and other component parts of 3 different types, the development has been restricted to 2 controls and driving pumps which are also a geometrical progression, and which are incorporated into the machine in the form of constructional units. The very constructional dimensions have been restricted to but 2 values within the 3 models, whereby for the models 1000 and 1400 also the same constructional units, such as regulating devices, feed and control boxes, reversing and rapid power gear mechanisms, have been employed. By this arrangement the operating elements are of the same shape and size. The operating sides of the divers models are all alike, so that no difficulties arise, if the operators of the machines are exchanged.



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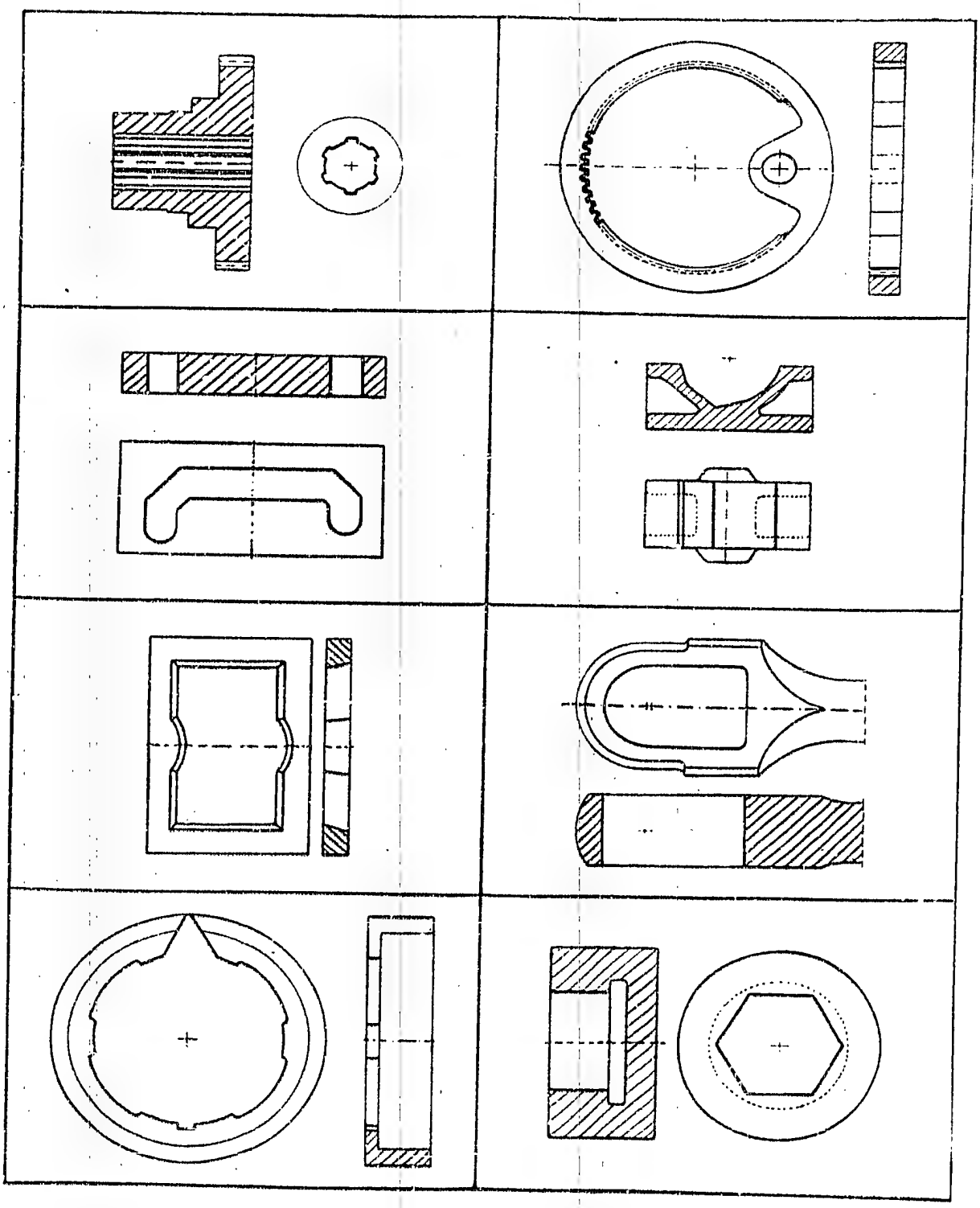

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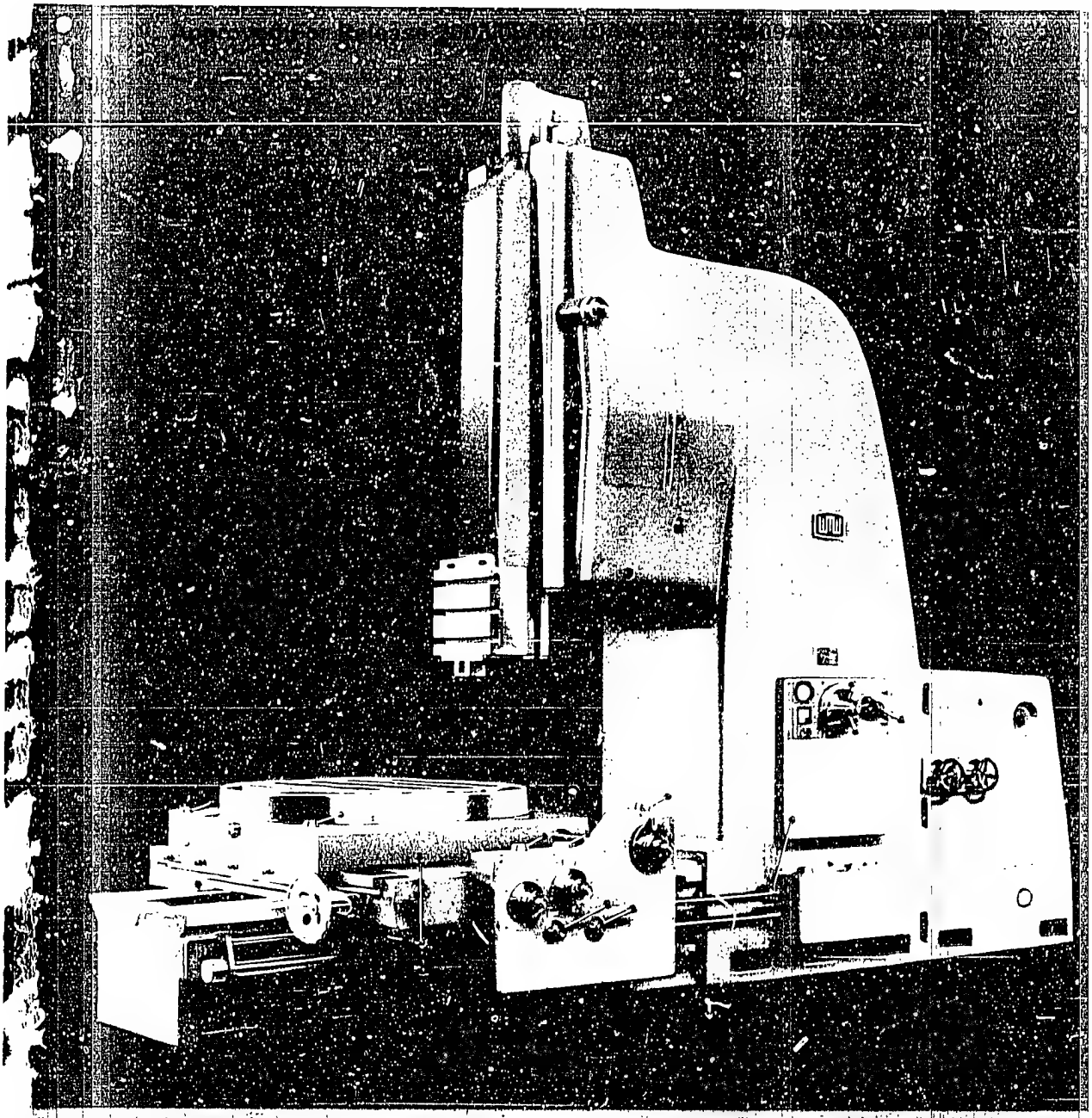
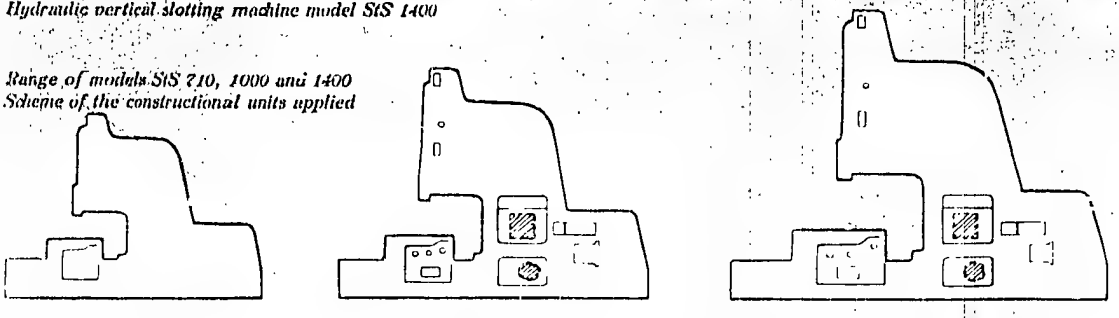
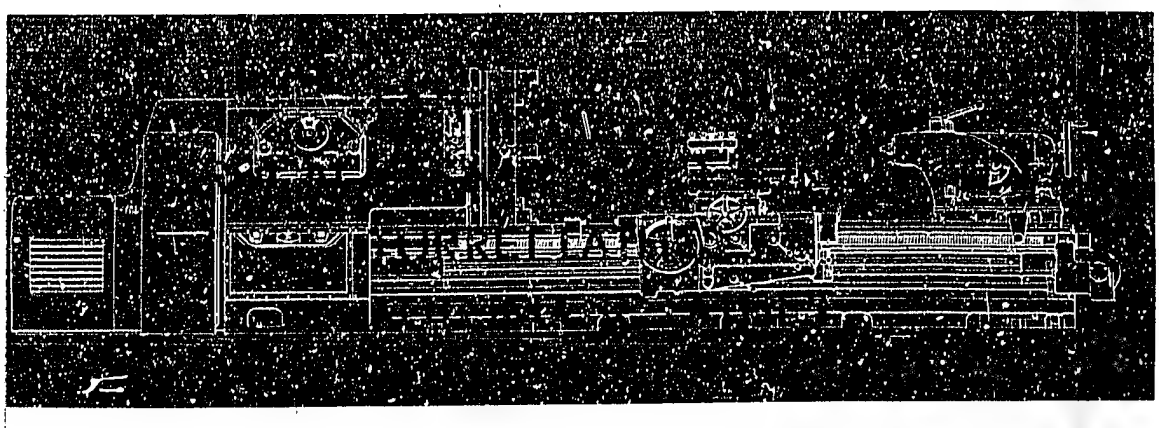


Hydraulic vertical slotting machine model StS 1400

Range of models StS 710, 1000 and 1400
Scheme of the constructional units applied



Like constructional units or groups are represented in white colour or shaded thus: //////



The lathe models of the range DLZ 400—1000 are high-efficiency machines and adapted to the varied requirements of machine-building. At the same time they do not overlook the modern ideas of high-speed metal-removing technique. A newly designed pre-selection device for the headstock gearing results in a simplification of the attendance with the advantage of boosting the output. The spindle speeds and chief dimensions are stepped in geometrical progression according to German standards DIN 323, and so are the swing-over bed (by which the specific model is acertained), the width of the bed, and the turning lengths. The same constructional ideas have been realized in the internal design of the machines.

Outstanding features of the new WMW-lathes are:

Deep-lying and protected V-guides for the carriage, large beds, and an optimal reception of the cutting pressure.

Thru-guiding ways before the headstock and under the gap.

Optimal arrangement of the feeding organs between the cutting edge of the tool and the carriage guide.

High accuracy for multiple tripping operations for both longitudinal turning and for facing by means of an overload ball type clutch.

Adaptation of the range of speeds to the divers requirements.

Arrangement of the main gear mechanisms in the front part of the headstock, so that a good meshing is obtained which counteracts the component of the cutting pressure.

Good effect of the light falling in upon the work-piece.

Organic mounting of the main driving motor in the axial prolongation of the bed, transmission by V-belts.

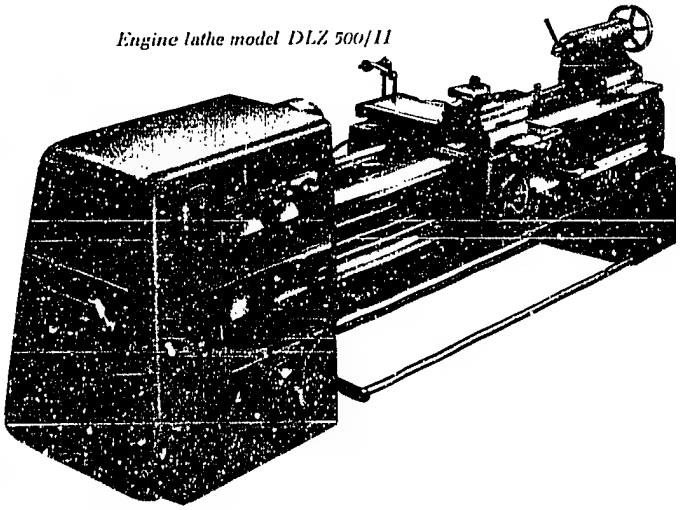
Arrangement for cutting coarse threads.

Arrangement for fine feeds.

Indexing device for cutting multiple threads.

Circular lubrication for the headstock gearing and forced oil central lubricating system for the main carriage.

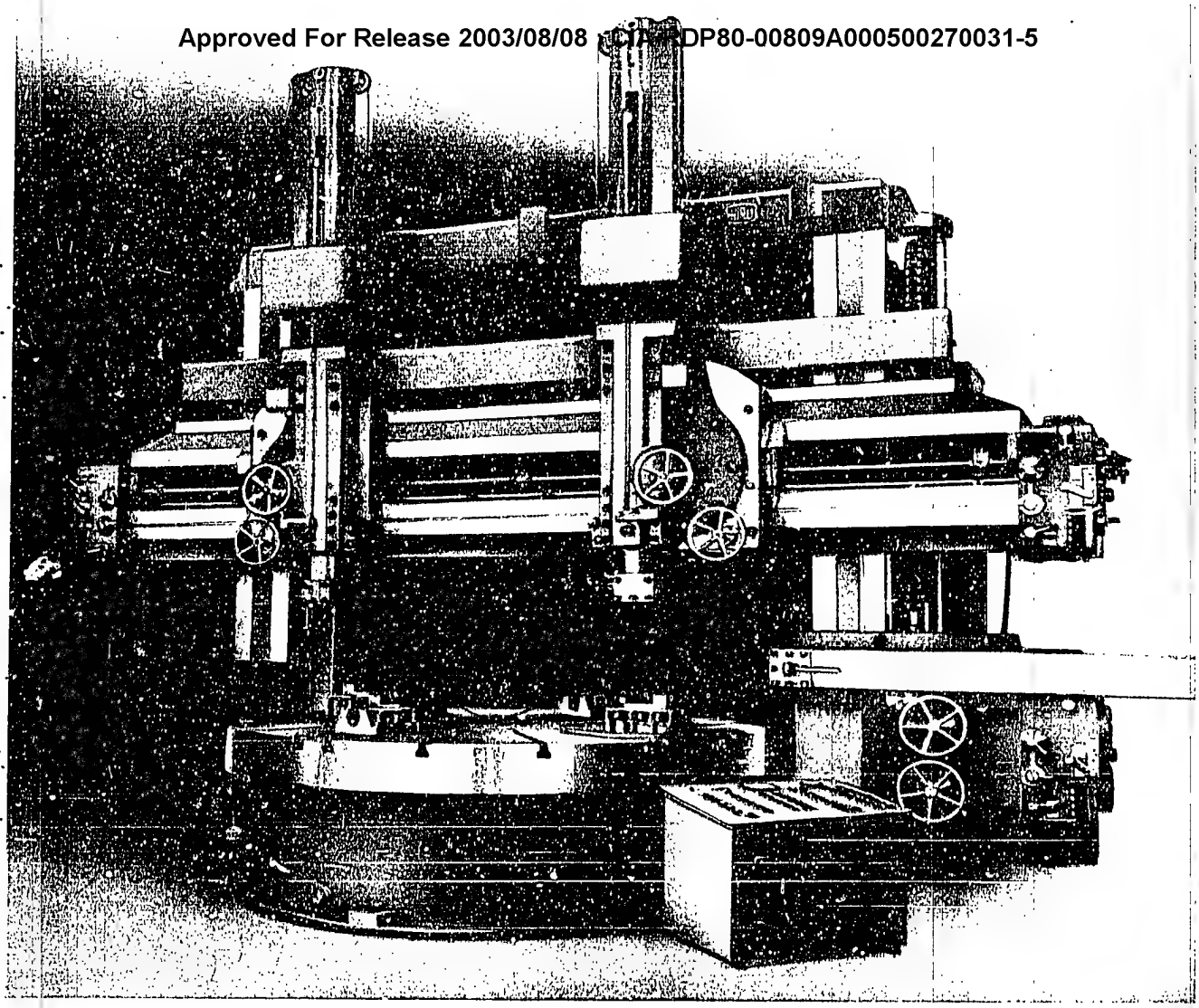
Engine lathe model DLZ 500/II



ENGINE LATHES MODEL DLZ 500/II

For the model DLZ 500/II the spindle speeds and chief dimensions have also geometrical progressions according to DIN 323, and so have the swing, width of the bed, the turning length, and the internal constructional design.

Approved For Release 2003/08/08 : CIA-RDP80-00809A000500270031-5



DOUBLE COLUMN VERTICAL BORING MILLS MODELS DKZ 2000 x 1250 – 6300 x 2500

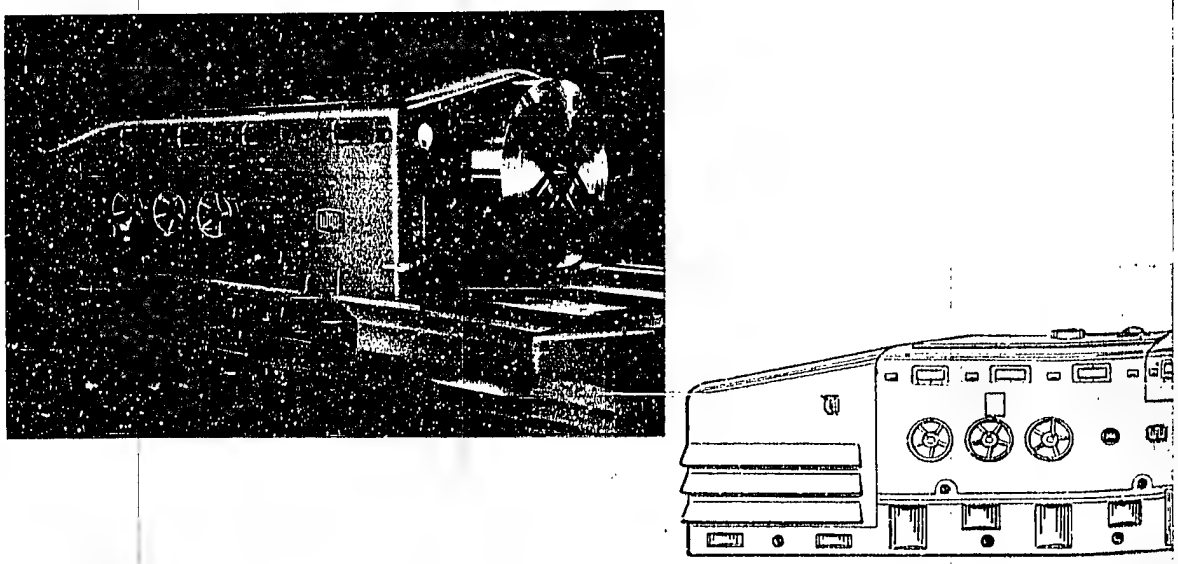
The development in the design of double column vertical boring mills proves very clearly the progresses made in heavy machine building. Flywheels, turbine housings, cylinders and similar workpieces with large diameters and heavy weights are conveniently clamped and machined upon the table of the vertical boring mill. The table speeds correspond to the cutting speeds which are necessary for machining with high-speed cutting tools, and which correspond also to the cutting speeds for the economical utilization of carbide tipped tools. The tools are located in the tool slides of the right-hand and left-hand tool heads on the cross rail, and in the side-arm of the right-hand column (as a special attachment). All tool slides and heads can be displaced by hand, by slow feed motion, or by pushbutton controlled quick motion. Special attachments on the feed boxes of the cross rail permit

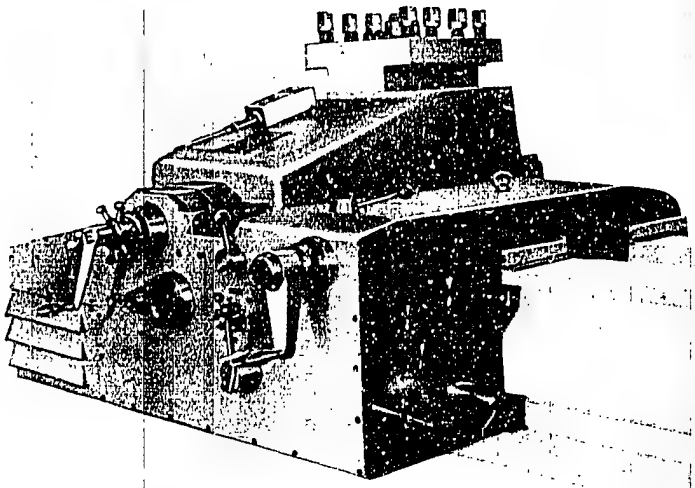
threading operations with the right-hand head, and taper turning operations with the left-hand head. The whole control of the machine, including the setting of the table speeds, ensues from a control desk beside the machine. Quite independently of this, the control of the slow feed and quick motion of the heads may be effectuated either on the heads themselves, or through the feed box of the cross rail.

The large diameter and widely dimensioned way of the table causes, in conjunction with a carefully designed circulating lubrication for the coolant, the friction heat to keep within the admissible limits and to obtain a high total efficiency of the machine. The table speeds are set by an electro-mechanical gear mechanism, they are, moreover, steplessly variable at the ratio 1:3. The change of the speeds is carried out by pushbutton control on the control desk. An outstanding and ingenious design has been embodied in the feed gear mechanisms for the cross rail and the side arm. The superposition of the slow feed motion and of the quick motion will allow at any time to make use of the quick motion in both directions, even if the feed has been engaged. The feed motion of the cross rail heads is limited by stops, and ceases automatically without any subsequent movement. It is also possible to stop the feed motion at the heads by hand at any given moment. The quick motion of the heads is interrupted, if the feed motion in the same direction is automatically engaged, and can only be used for the opposite direction.

ROLL LATHES MODEL DXW

Lathes for turning heavy rolls are built in 3 models having a swing over bed of 550, 950, and 1350 mm respectively. The model as illustrated is of the biggest heavy-duty type and a new design. The outward appearance of the machine gives evidence of the modern engineering thoughts embodied in the design, in conjunction with practical experiencies gained by the collaboration with rolling mills. The machine has a headstock, a two-way bed, double tool rest and a face plate type tailstock; it is manufactured with a swing of 1350 mm and a turning length up to 8000 mm. If so required by the working conditions, the machine may as well be equipped with a centre tailstock. The headstock rests upon the base and is connected with the bed. It carries also the driving motor. Even the traditional control cabinet forms a unit with the headstock. The switches for the oil motor for the gearing, the main drive and the pushbutton control are located on the end side of the headstock; they may be at

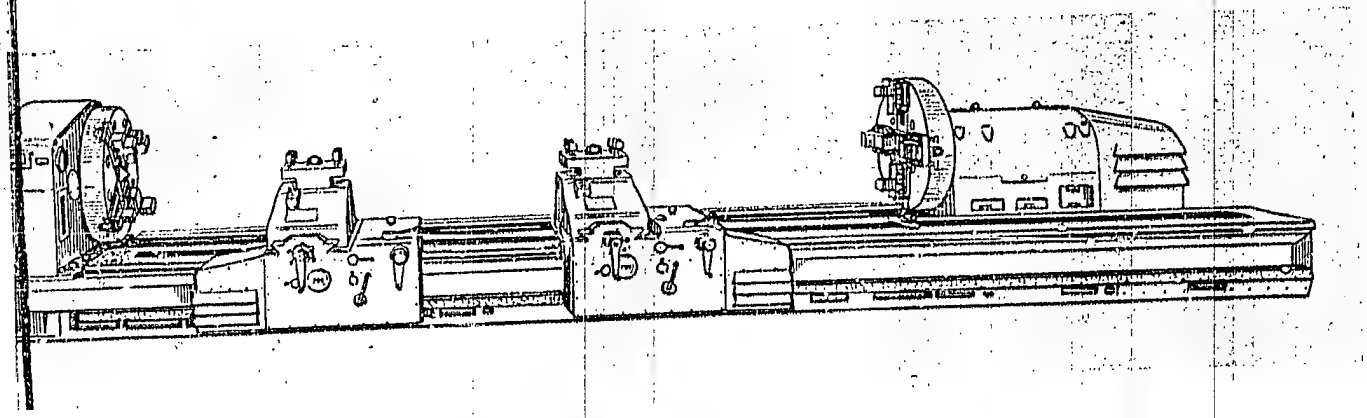


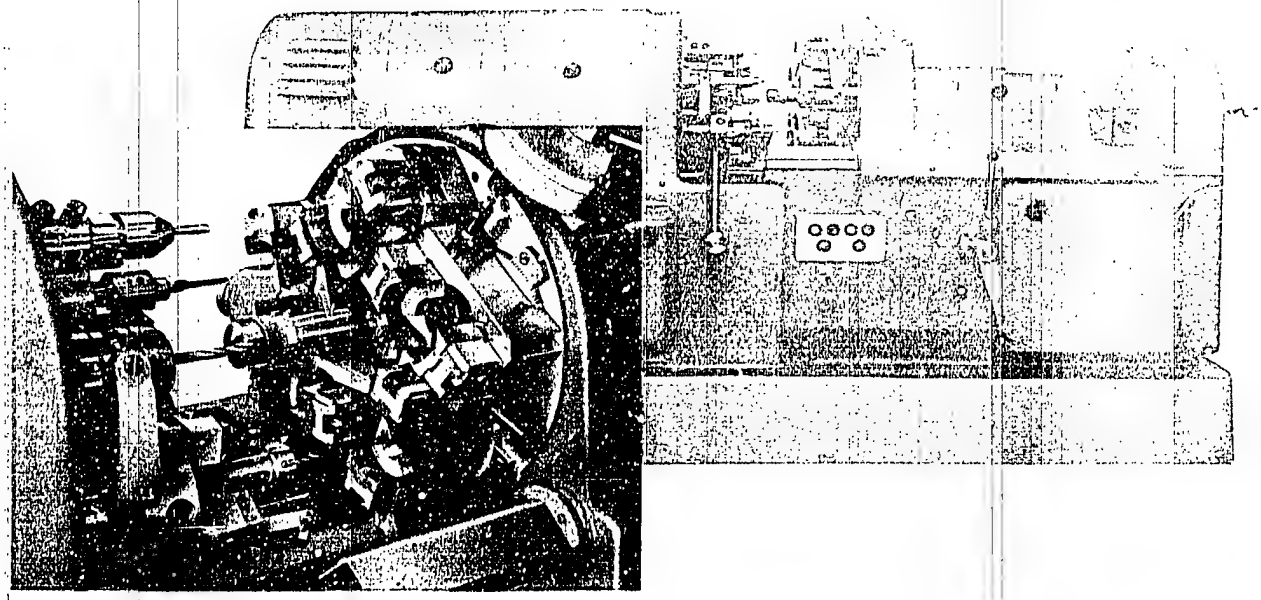


the same time controlled from either carriage by means of the control board. The carriages are equipped with self-contained motor drive, and meet all demands of modern machining technique. The longitudinal, facing and quick motion traverses are controlled by the motor for the apron box, the number of feeds amounting to 52, which is very near to stepless control. The machine is equipped with 7 motors. A 5-step contactor controller with large dimensioned instruments will meet the severest continuous service. A time relay device has been built in for the touch type control, in order to prevent an excess of wear of the contactors due to the controls following shortly one after the other.

The cutting capacity is best characterized by the fact that turning cast steel rolls having 1200 mm diam. with both carriages resulted in chip sections of 400 mm² which corresponds to a metal removing capacity of more than 1000 kgs. per hour.

Roll lathe DXW 1350

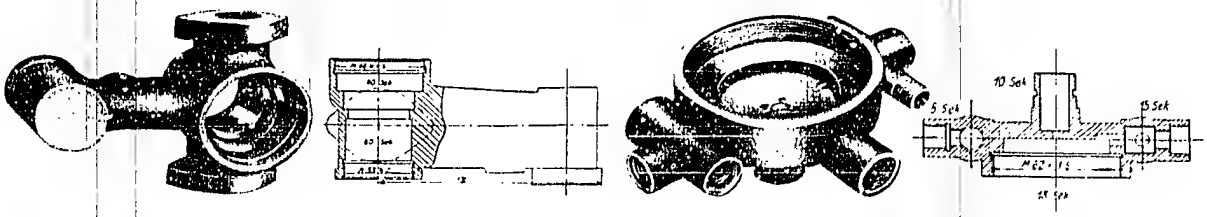




MULTI-SPINDLE AUTOMATIC LATHE DAM 5x160

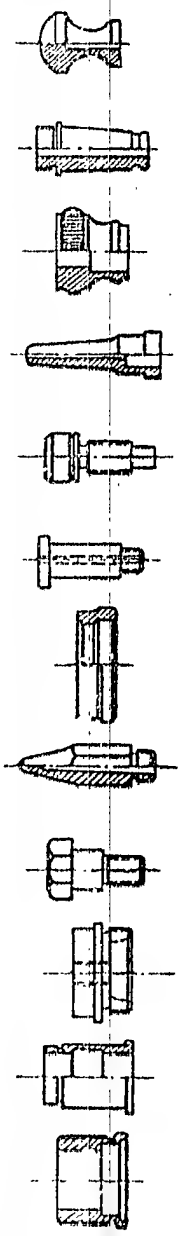
The chucking automatic is particularly fitted for a variety of form-turning operations, such like forgings, die-formed parts, castings, cut-off rolled products from light metals, brass, grey casting and cast steel. The threading and tapping capacities amount to M 60, the max. swing being 160 mm, and the turning length 300 mm. The field of application comprises the manufacture of fittings, component parts for automobiles and cycles, for the vehicle industries in general, for locomotives, light combustion engines, and for apparatuses.

The spindle speeds may be set by means of change gears in a partition of the headstock housing in such a way that each spindle has a speed different from that of the other spindle, or that all spindles run with the same speed. The feeds have time selection and may be set from 4,6 to 164 seconds by changing the gears in the gear box. The rotations of the threaded spindle depend upon those of the workspindle, its reverse speeds being the double of the workspindle speeds. It may be optionally used as a workspindle. The control drum is equipped with constant cam portions for the forward and return movement during threading operations. The sturdy double locking device of the turret head is free from any load during the working process. After every control the turret head is automatically locked with the box type carriage. By these means the working pressures of the 5 spindles, and the bumps caused by unilateral and polygone workpieces, are kept off from the locking device which is intended for accuracy only; in addition to this the unavoidable play in the turret head is eliminated.

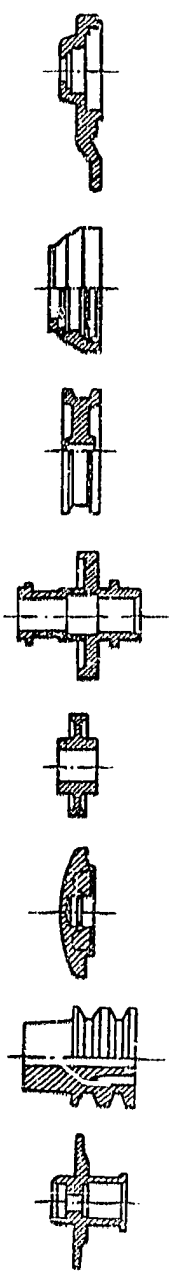


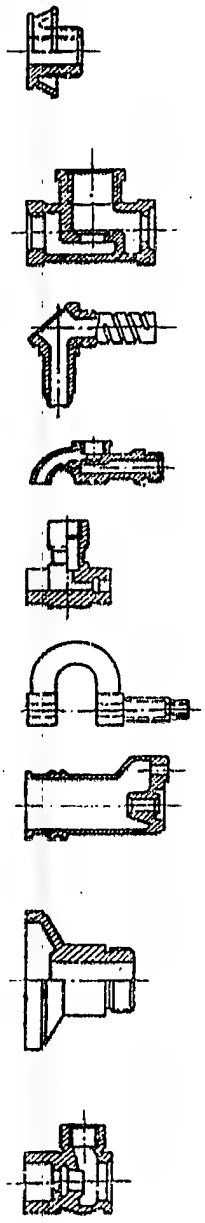
TURRET LATHE JOBS

ROD JOBS



CHUCK JOBS



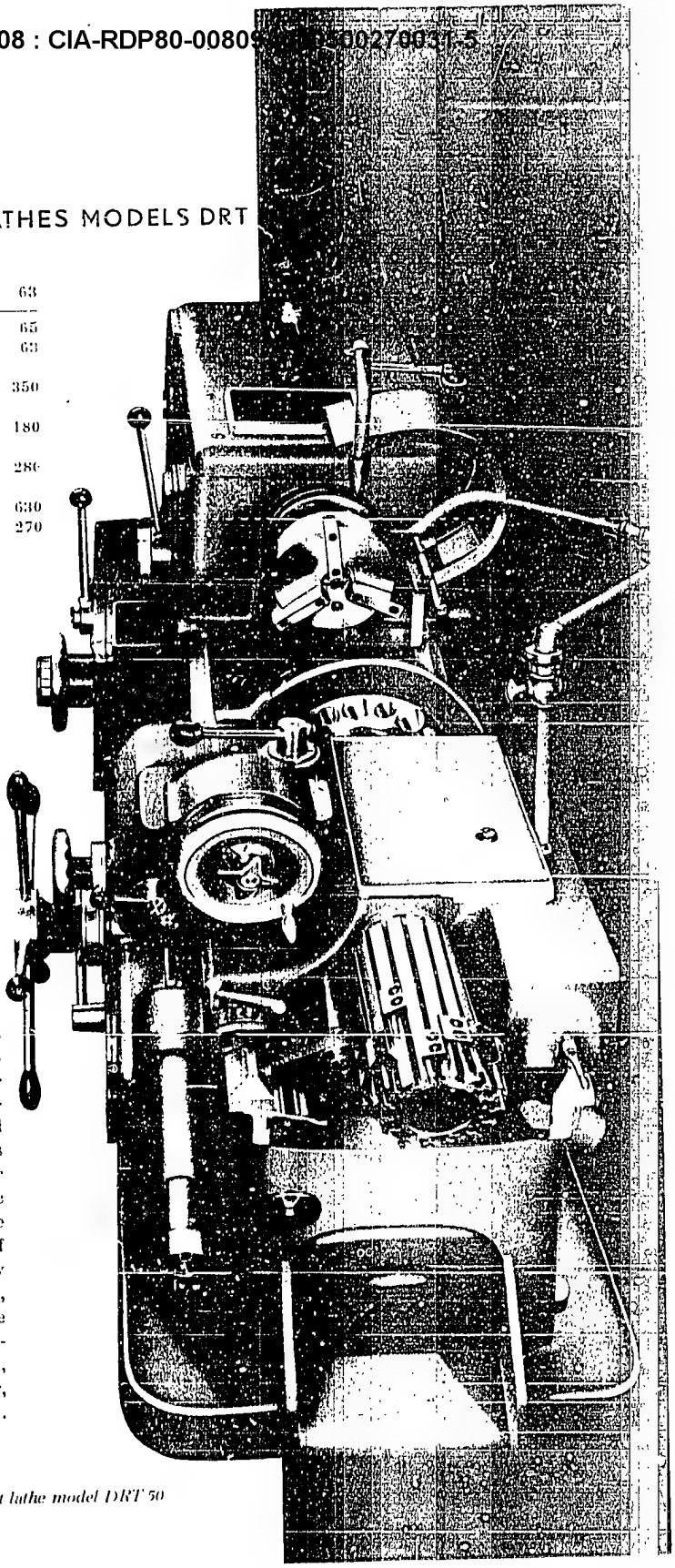


TURRET WORK

ON THE DRUM TYPE TURRET LATHES MODELS DRT

Chief specifications models DRT		36	50	63
Bore of spindle	mm	38	52	65
Diameter of work admitted	mm	36	50	63
Max. swing with thread chasing attachment	mm	280	300	350
Admitting chuck work up to approx.	mm	115	160	180
For chuck work with but few tools	mm	180	225	280
Max. feeding traverse of drum turret slide	mm	460	530	630
Diam. of turret hole circle	mm	180	210	270

As a rule, turret lathes are employed for small batch production of at least 15 to 20 pieces. It has proved to advantage, however, to use turret lathes for batches even still smaller, e. g. of about 10 pieces each. The drum type design permits the application of a great many standard tools, so that the setting time is favourably influenced, and low production times per piece are obtained. The employment of automatic lathes for small and medium series production results unprofitable on account of the high setting times. Even if the setting operations of single or multiple spindle automatics are relatively simple ones, yet the setting times will always be higher than for the turret lathe. The drum type turret lathe is an extremely versatile machine and, therefore, indispensable for nearly all production parts in the precision mechanics, in the general engineering and machine tool manufacture, in the railway carriage, locomotive, or ship building industries, electrotechnics, for the manufacture of fittings and other parts. The drum type turret lathe is particularly fitted for bar work and for medium sized chuck work. The characteristic feature of the drum type turret lathe is the arrangement of the head for the location of the tools. This drum type head is horizontally arranged, and possesses 16 turret tool holes, the top one of which is flush with the centre of the workspindle. By these means a transverse rotary movement of the tool is achieved, and no additional cross slide for facing, recessing, or cutting of operations is required.



Drum type turret lathe model DRT 50

PRÄZISIONS-LANGDREH- UND SCHRAUBEN-AUTOMAT

PRECISION LONG-TURNING AUTOMATIC SCREW MACHINE

MODEL 652 ORIGINAL RUHLA. Diameter of work admitted = 6 mm, max. spindle speed = 5150 r.p.m.
(Optionally model 653 with 8 mm diam. of work.)

The precision automatic screw and long-turning machines model 652 (max. diam. admitted 6 mm) and model 653 (max. diam. admitted 8 mm) are intended for the turning of component parts of the clockmaking and optic industries, for the precision mechanics, electrotechnics, and others. Versatile special attachments facilitate the parts to be drilled, reamed, threaded, tapped, or slotted.

The long-turning automatics have a max. turning length of 70 mm, and are based upon the approved principle of the axially adjustable headstock. There

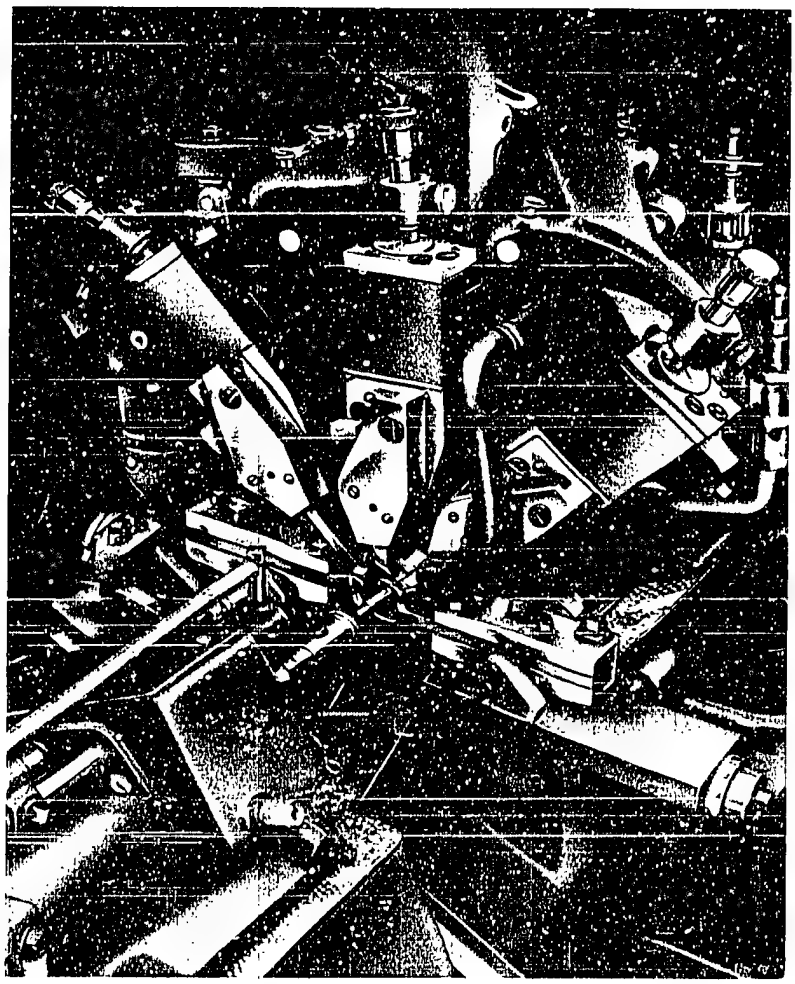
are 15 spindle speeds available between 1400 and 5150 r. p. m. The camshaft has 48 speeds per spindle facilitating machining times from 1,2 to 215 seconds per piece. The machine is equipped with 5 tools, of which 2 are arranged on a swivel type tool holder.

The front bearing of the main spindle is a plain adjustable friction bearing, and made of high-quality bronze, whilst the rear bearing consists of 2 radial ball bearings. Long chucking levers which are secured by spring pressure against breakage in case of differences in stock diameter, ensure a positive chucking of the rod. At the end of the rod a mechanical transmission takes place to an electrical system by which the driving motor is stopped. A safety releasing device protects the machine in the case of belt damages or against troubles during threading, tapping, or slotting operations.

The accuracy of parts manufactured upon precision long-turning automatics amounts to 0,01 mm.

As an additional special attachment a 5-spindle turret head has been newly designed which is equipped with 3 drilling and 2 tapping spindles. With the aid of this turret head, holes with 5 mm diam. × 25 mm depth can be drilled, and the respective tapping capacities are M 4 into steel, and M 6 into brass, also 25 mm deep.

Another long-turning automatic is now in preparation having the same working principles as model 652, and a max. rod diam. of 18 mm. The development of this larger model is now nearly being brought to a close.

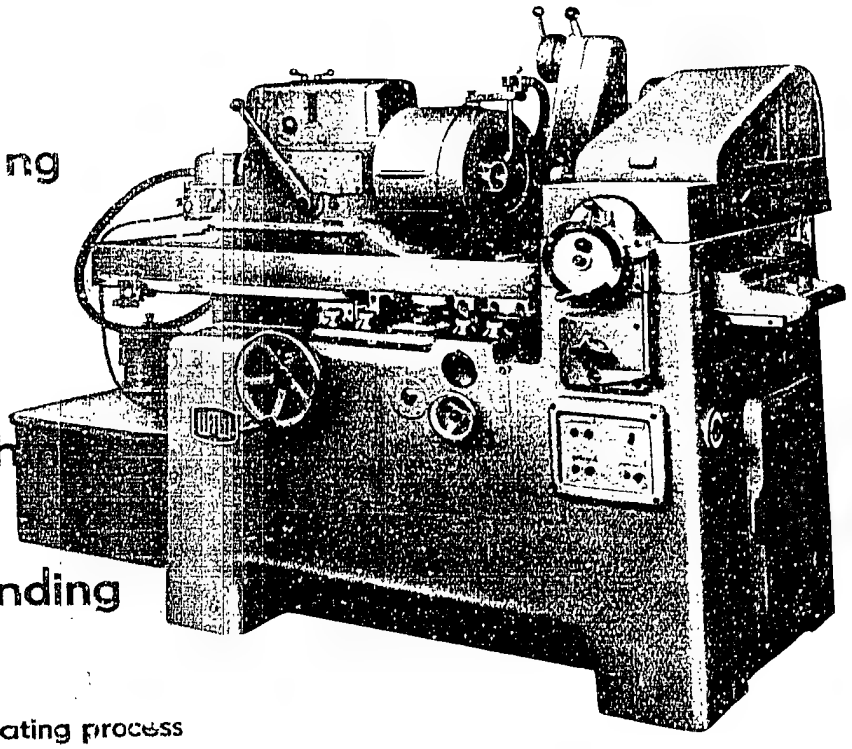


Internal grinding machines

Centerless grinding machines

Spur gear grinding machines

working by the generating process



Internal grinding machine model SI 125×175

INTERNAL GRINDING MACHINES MODELS SI 40, 125, 200

The model SI 125 × 175 is a newly-developed design within the range of manufacture and represents a general purpose machine for internal grinding work with a capacity of 25 to 125 mm grinding diameter and 175 mm max. grinding length. The standard models are not equipped with an electric sizing device which is provided for the larger models. The field of application is enlarged by optional special attachments, such like face grinding attachment, chucking device, and self centering three-jaw chuck.

The face grinding attachment has an individually driven built-in motor which is automatically started or cut-out by raising or dropping said attachment. A built-in swivel taper truing device secures an accurate dressing of the grinding wheel face. When grinding the faces of tapered holes, the whole face grinding attachment may be swivelled within definite working tolerances and in conformity with the swivel of the work headstock.

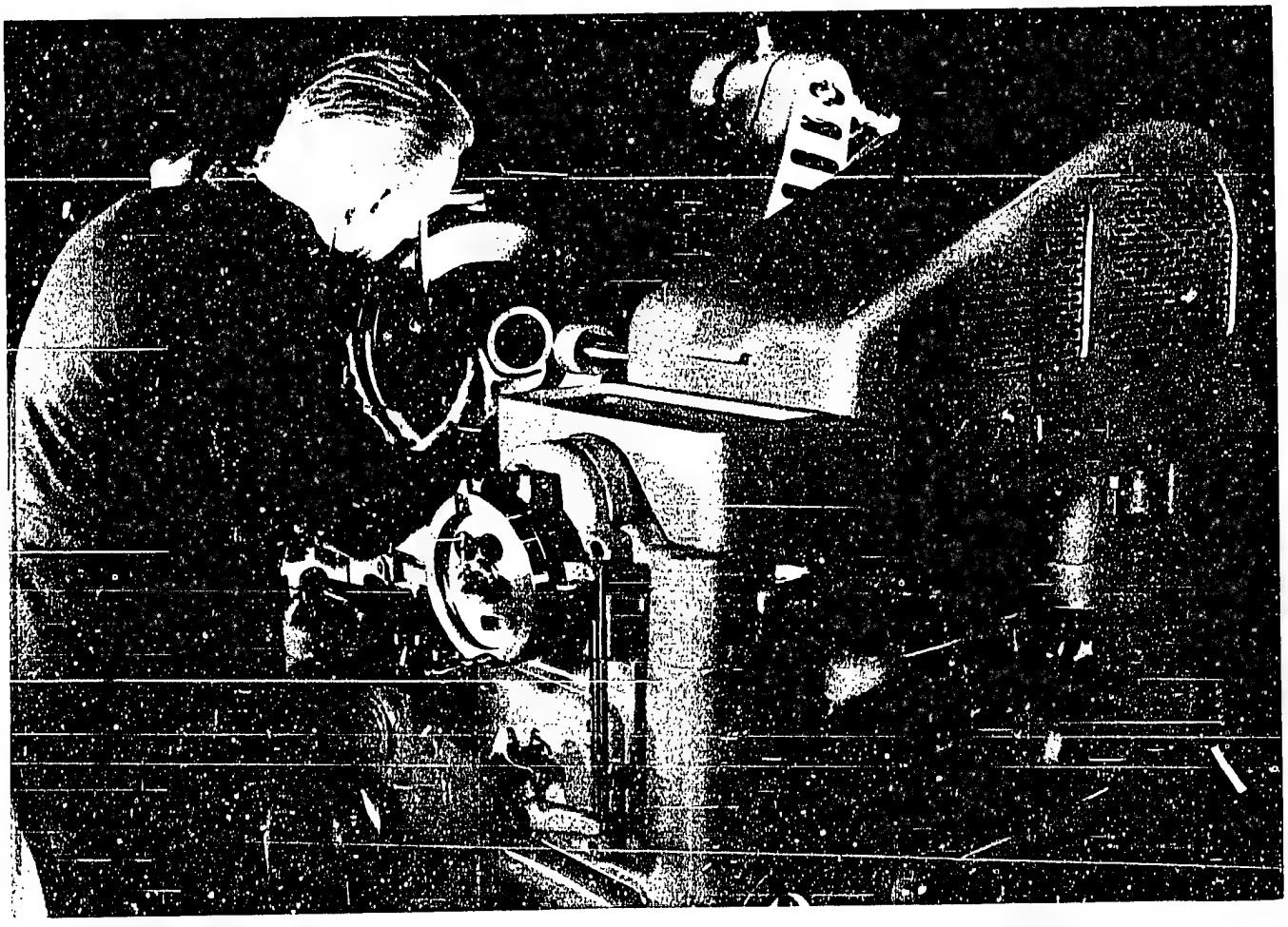
For the chucking of small workpieces up to 90 mm diameter and for larger parts with a chucking diameter up to 150 mm, quick action chucks with gliding jaws are applied. This graduation of two sizes was chosen in order to avoid too high centrifugal masses for the smaller workpieces which rotate very quickly. The quick action chucks with gliding jaws are fitted for workpieces permitting a radial chucking. Operating the chuck is performed through a spring collet tube and a handlever which shifts the bottom jaws in the wedge-shaped guides, thus

chucking or unchucking the workpiece as it is required. The upper jaws are provided for the specific workpiece, and are ground to fit the chucking diameter of the latter.

The self-centering three-jaw chuck with an outside diameter of the flange 190 or 250 mm is intended for single piecework and for such parts, for which the use of quick action chucks would not be economical.

For form grinding, a semi-circle wheel truing attachment, a bevel truing apparatus, or a form truing device (with former) are available. These attachments are interchangeable, and located in a support which is placed upon the base after the face grinding attachment has been removed. A special locking device will positively stop the motion of the table during plunge-cut grinding at any working position desired.

Chief specifications	models	SI 50	70	SI 125	175	SI 200	280
Smallest diam. of hole to be ground in mm		4		25		30	
Max. diam. of hole to be ground in mm		50		125		200	
Max. grinding length in mm		70		175		280	

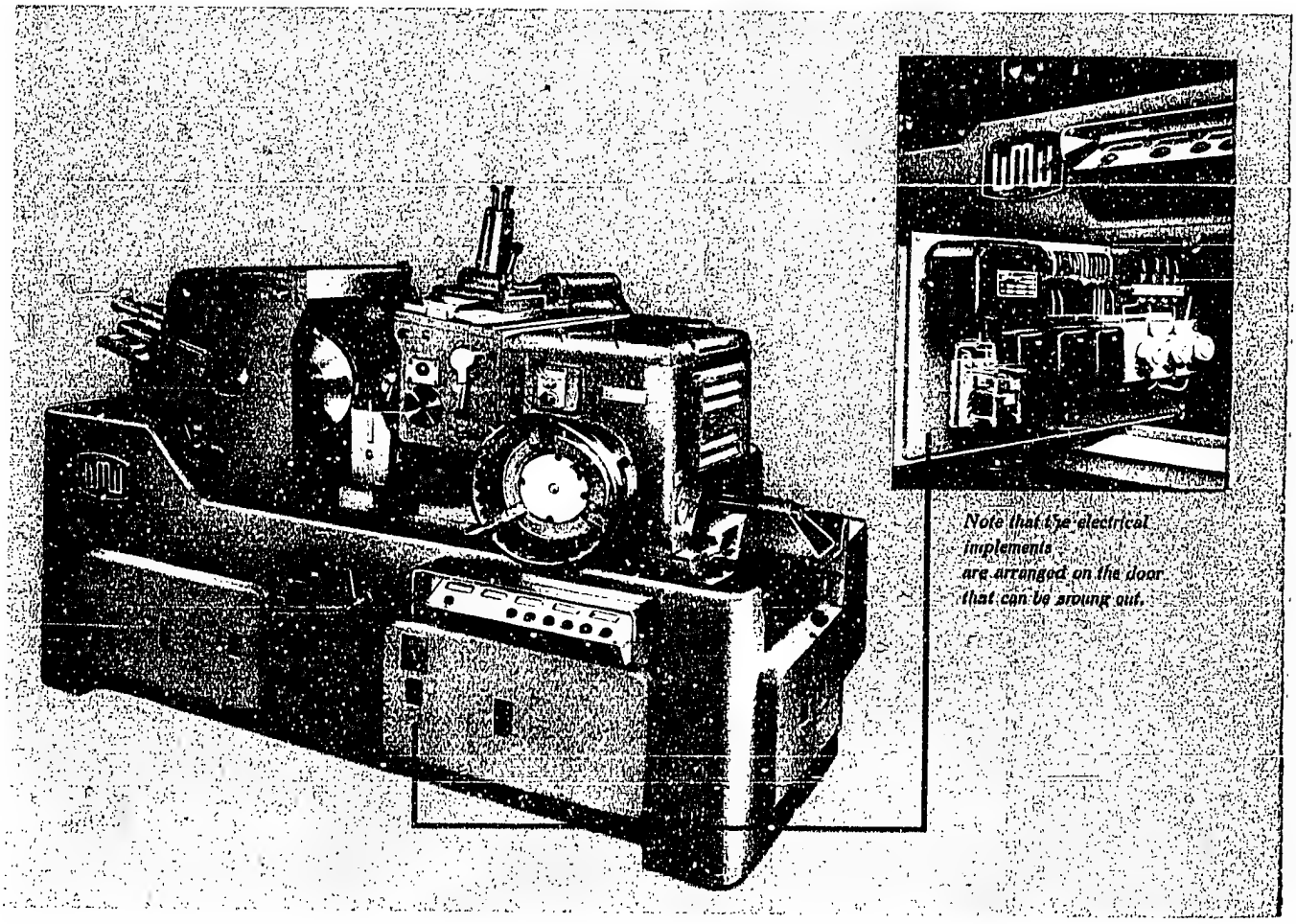


CENTERLESS GRINDING MACHINE MODEL SASL 200x300

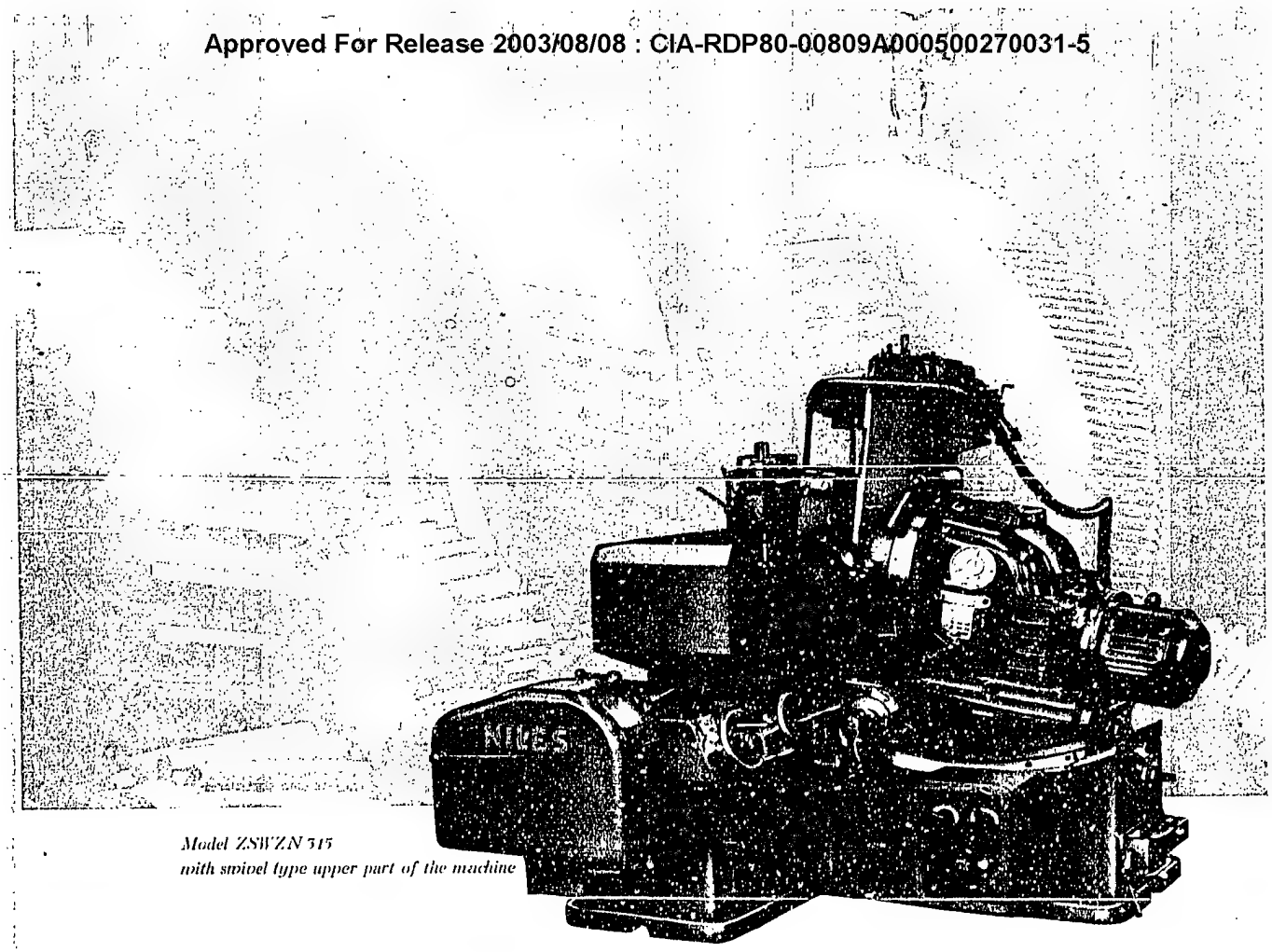
with overhanging grinding wheel running in friction or plain bearings, with the bearing arrangement for the grinding wheel firmly mounted to the bed, and with adjustability of the feed wheel in the direction of the grinding wheel, and swivelling motion of aforesaid feed wheel round its vertical and horizontal axis.

For the centerless grinding process the quality of the grinding wheel regarding its hardness and its grain, as well as the quality and bond of the feed wheel, are of the greatest importance. Peak outputs depend also upon the proper choice of the grinding wheels. The grinding operations are carried out according to the circumstances and shape of the workpiece either as through-feed grinding or as plunge-cut grinding.

The through-feed grinding method is characterized by a continuous grinding operation with the workpiece being fed accordingly. The gap between the wheels remains unchanged during the grinding operations, and the workpiece, which is axially fed through the machine, must not have shoulders or other protruding portions larger than the diameter to be ground. During infeed grinding, the gap between the wheels is variable or, in other words, the workpiece is laid into the opening between the wheels and the gap is then reduced to the previously set diameter whilst the grinding process is in operation. The grinding process suffers an interruption after the workpiece has been finished. This space of time lost is minimized by special attachments, e. g. loading devices, magazine feed attachment, ejector, and automatic infeed motion. Workpieces with shoulders or projections are ground by the usual infeed process, whereby the length of the cylindrical portion to be ground must not exceed the max. width of the grinding wheel minus 5 mm. Tapers up to approx. 1 in 20 may also be ground without any special attachment by plunge-cut grinding. If the workpieces have more than one concentric cylindrical portion, or tapers, or if curve profiles are to be ground, both the grinding wheel and the feed wheel have to be dressed with special profile wheel dressing carriages.



Note that the electrical implements are arranged on the door that can be swung out.



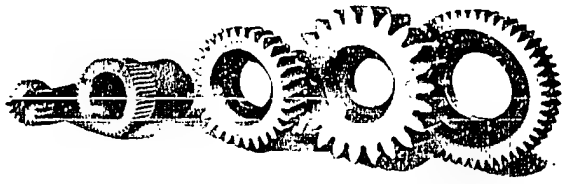
Model ZSWZN 315
with swivel type upper part of the machine

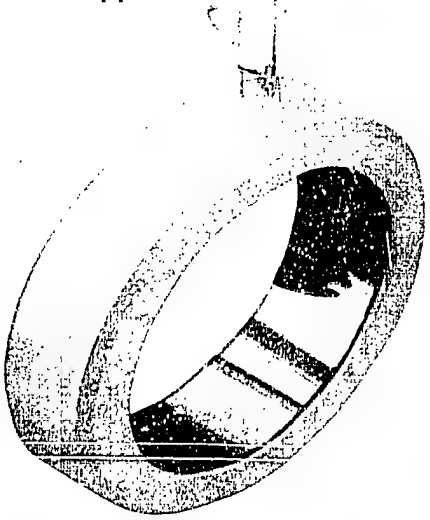
SPUR GEAR GRINDING MACHINE WORKING BY THE GENERATING PROCESS MODELS ZSWZ 315 AND 500

With the aid of these machines gears may be ground which have different numbers of teeth and module, and sometimes even different angles of pressure, by employing the same grinding wheel without the least distortion of the profile. The machines are provided with a simple device for dressing the profile of the grinding wheel and are, therefore, very versatile machines. The involute gears thus ground have exceedingly good running qualities and admit to a large extent small errors in centre distance. The machine grinds involute gears with any correction of the teeth desired.

The application of the involute tooth system is inasmuch advantageous as the geometrical law of the involute is realized with relatively simple kinematics, and because all involute profiles are generated by straight-flanked tools. The method of operating for generating an involute is called the generating process. This process is of great advantage for the milling and shaping of gears, and for the grinding of tooth flanks on the gear generating grinder on account of the tool savings attained by it.

The model ZSWZN 315 is a special design to grind, besides standard spur gears, also Fellow pinion type cutters. The upper part of the machine is swivelling and adjustable up to 8 degrees.





HONING

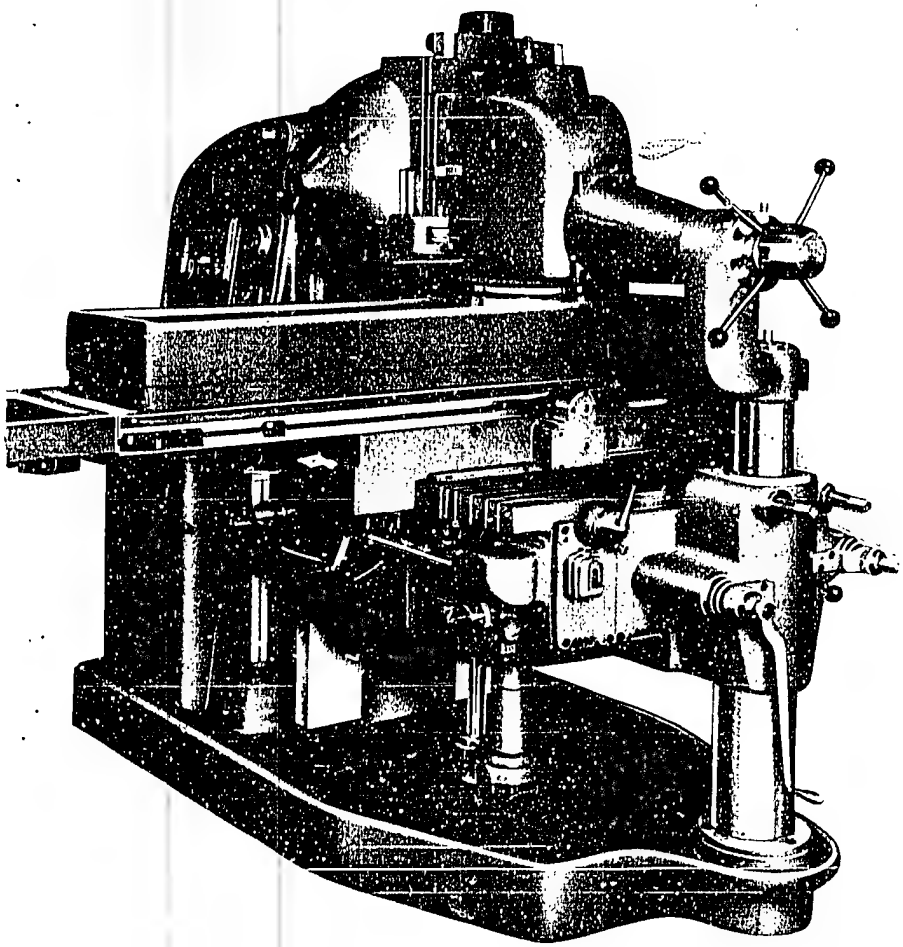
Every modern working process in a manufacturing shop ought to have, besides the realization of the practical knowledges gained, also a sound scientific basis. Only by a close co-operation between theory and practice, the necessary conclusions can be drawn for the utilization of all possibilities. Comparing the structure of surfaces which have been produced by different kinds of finishing and super-finishing operations, reliable conclusions can be drawn regarding the results obtained by honing. The critical inspection of high-quality surfaces is very difficult when done merely visually. It wasn't until the non-cutting process, and the measuring of super-quality surfaces by means of the interference microscope were introduced that exact data could be got with regard to the structure of surfaces that had been finished and super-finished. Interference microphotographs show distinctly the crosswise grinding due to the compound honing motion, and which is visible to the naked eye down to 0,00025 to 0,0004 mm max. roughness. This crosswise grinding, just perceptible to the eye, is essentially the cause that engineers less versified upon the special honing field entertain a distrust to honing, thinking that the surface finishes obtained do not answer to their demands. The honed surface, however, will fullfill more than a superficial inspection does suggest. If surfaces have the marks caused by machining directed uniformly, as in the case of plain or internal grinding operations, so that the shadows of the doubtlessly still existing "ridges" will fall into the same direction, then the naked eye is deceived by apparently very smooth surfaces. The crosswise grinding is more distinctly visible as an effect of the shadow. The greater irregularity of the surface is, however, only apparent. The truth is that by applying the honing process for the finishing operation, we very nearly approach the conditions that exist for gliding machining members having run in. There is no doubt that the surface of the honed part possesses the most compact structure. A honed surface may be exposed to a much higher specific surface pressure than another surface that has been only ground or finish-turned. By the high surface finish the coefficient of friction is reduced, and optimal gliding qualities are obtained so that the efficiency of the machine and its service life are heightened, whilst the driving power is reduced. These advantages will be still more set off, if both gliding surfaces are finished by honing, e. g. the bore and the shaft, the cylinder and the piston, or the control box and the slide valve.

The same importance must be imparted to the external honing process.

UP-TO-DATE MILLING MACHINES

FROM THE WMW-RANGE OF MANUFACTURE

The development of the milling tools — above all of the super-speed metal removing tools — has had a decisive influence upon the development of the modern horizontal, vertical, and universal milling machines. Hereby is the utilization of carbide-tipped tools of paramount interest. The demands for an increased output and a higher productive capacity are the outstanding features of the milling machine of to-day: ruggedness of construction, increased power of the electrical motors, an enlarged speed range and simultaneous reduction of the progressive ratios, a higher number and rate of feeds, cutting down the setting and operating times, bridging over of non-milling travels by means of quick motion traverses in all directions, the automatic change of slow feed motion and rapid power travers as well as right-hand and left-hand travel of the table with automatic engaging and disengaging of the spindle, so as to reduce the non-productive interval and to raise the output of the machine. All these features guarantee an automatic sequence of operations and make it possible to attend more than one machine at a time.



Vertical milling machine model FS

The various models of **VERTICAL, HORIZONTAL AND UNIVERSAL MILLING MACHINES FS, FW and FU**

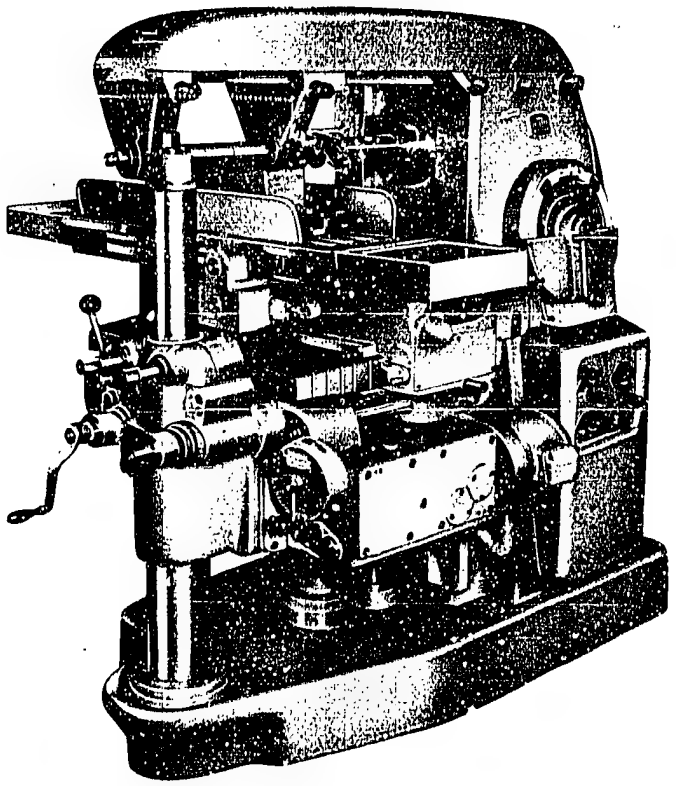
within the range of WMW-production comply with the above trend of development.

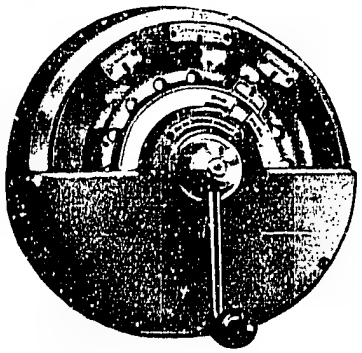
When compared with the former designs,

the speed selecting device

is gaining ground. It serves for the quick and reliable selection of the speeds best fitted for the purpose. The operator is thus given a means to set securely economical cutting speeds without any previous knowledges and without any auxiliary means. There cannot occur faulty controls.

Horizontal milling machine model FW





Machining of a workpiece with a disc cutter

Data given:

material to be machined	zinc alloy Z 410
diameter of disc cutter	$\varnothing$ = 140 mm
material of the cutter	high-speed steel

These three data suffice to set the most advantageous speed. The setting is done as follows:

1. Set hand (2) on diameter of cutter given (140 mm) by rotating disc with holes (1).
2. By the control of speed lever (3) the material to be machined (non-ferrous metal) is caused to coincide on the scale (disc with holes) (1) with the hand of the correspondent tool plate (4) (high-speed steel).

By these two manipulations alone the right cutting speed is selected and set. In the opening of the hand 2 the speed n = 112 r. p. m. is to be read off, and on scale 1 of hand 5 the cutting speed obtained v = 52 m/min. There is nothing simpler than this!

By a single lever control the attendance of the machine is essentially simplified, and the handling times are reduced. The direction of movement of the control lever corresponds in all cases to the direction of the table motion engaged, so that faulty controls are practically impossible.

Longitudinal motion

crosswise motion

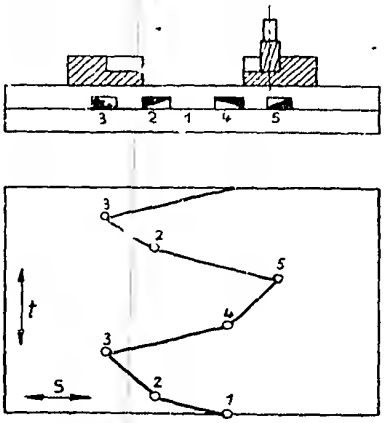
vertical motion

The principle of automatic intermittent feeding mechanism which had been introduced for the previous models of our milling machines, has been improved and applied also to the new models.

We give the following example:

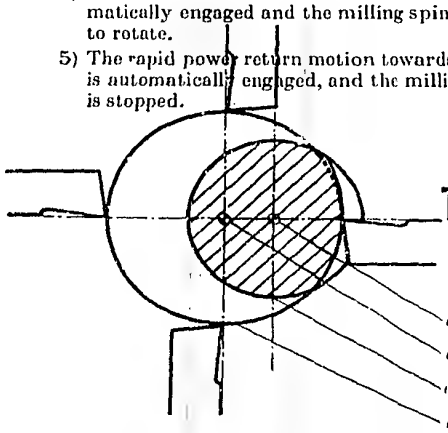
Plunge-cut milling by the reciprocating process for machining surfaces without runout. One workpiece is being machined, and the finished part simultaneously replaced by a new workpiece.

1) The quick motion towards the right is engaged by hand. The milling spindle does not rotate.
2) The slow feed motion towards the right is automatically engaged. At the same time the milling spindle begins to rotate.
3) The rapid power return movement towards the left is automatically engaged, and the milling spindle is stopped.
4) The slow feed motion towards the left is automatically engaged and the milling spindle begins to rotate.
5) The rapid power return motion towards the right is automatically engaged, and the milling spindle is stopped.



After this the controls 2 to 5 are repeated in an uninterrupted sequence. During the quick motion the milling spindle may either continue to rotate, or optionally be stopped.

It is of importance for all intermittent table feeds that the advance of the feed and the stopping of the milling spindle are carried out with delay.



Threading operations by means of fly-cutter milling

When compared with the thread milling machines employed up to now, the fly-cutter type milling appears more advantageous, because it results in an increased output, a high-grade finish, and a long life of the cutting tools.

The tool which has the form of an inserted tooth milling cutter revolves round the workpiece. The latter is passed through the fly cutter tool whilst the operation is going on. Both the axis of the tool and of the work are eccentrically displaced the one with regard to the other during the milling operations. The axis of the tool is furthermore inclined by the amount of the helix angle of the thread towards the axis of the workpiece. The circular cutter head incorporates on its circumference 4 carbide-tipped fly-cutters, arranged in one plane, each of which is adjustable and may be individually replaced.

The high metal removing capacity by fly-cutter milling is due to the application of carbide-tipped cutting tools which have a high resistance to heat, and permit thus high cutting speeds resulting in a relatively large chip production. In consequence of this, dry cutting is admissible which eliminates the oil cooling generally required for thread milling operations.

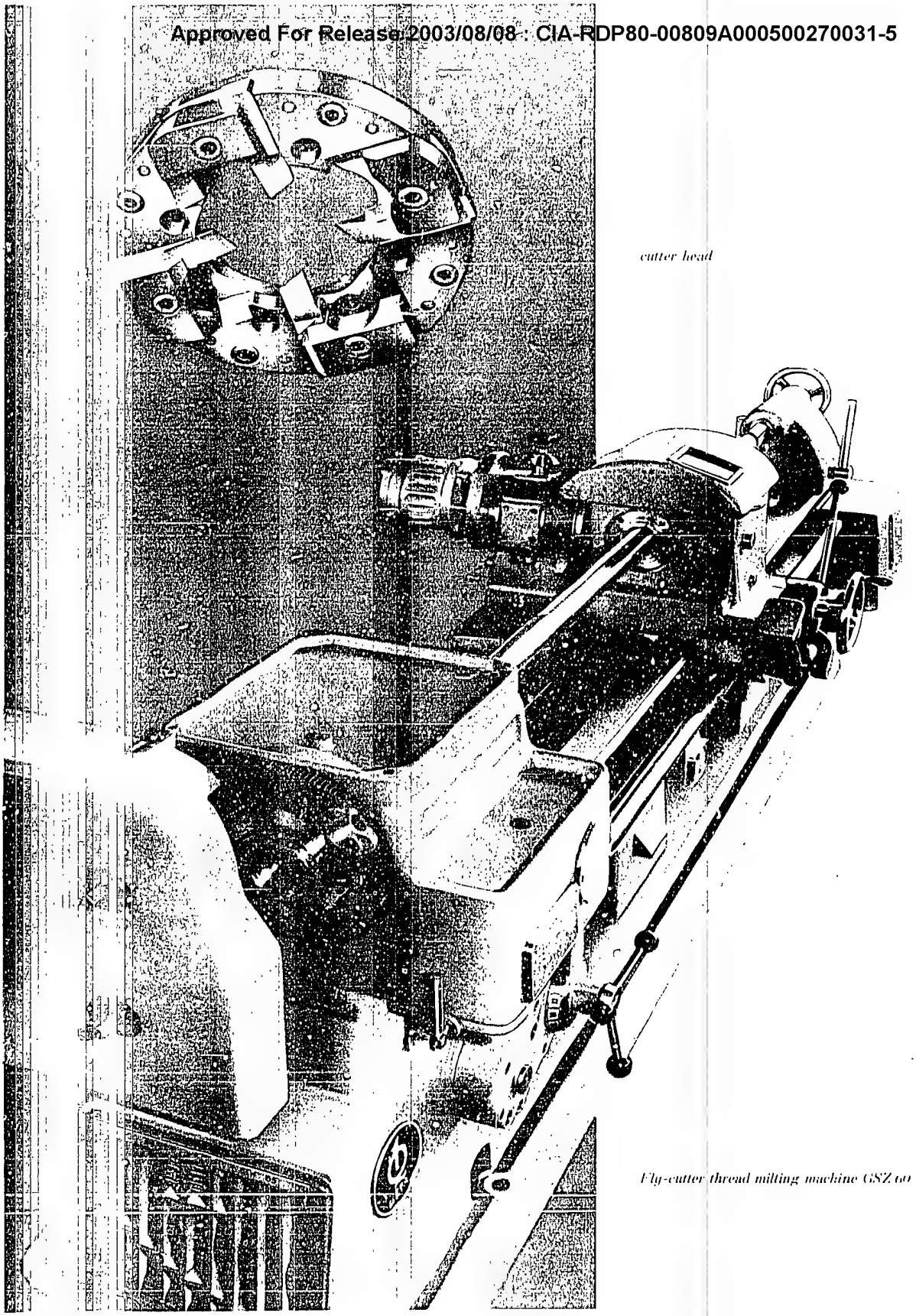
Comparison of cutting powers

Workpiece:

outside diameter = 60 mm
lead = ½" (trapezoidal thread DIN 103)
number of threads = 1
length of thread = 1375 mm
material = St C 60. 11 (German standards)

Machining times for:

Long thread milling	Long thread fly-cutter type thread milling
250 minutes (circumferential feed 80 mm/min)	24 minutes (circumferential feed 860 mm/min)



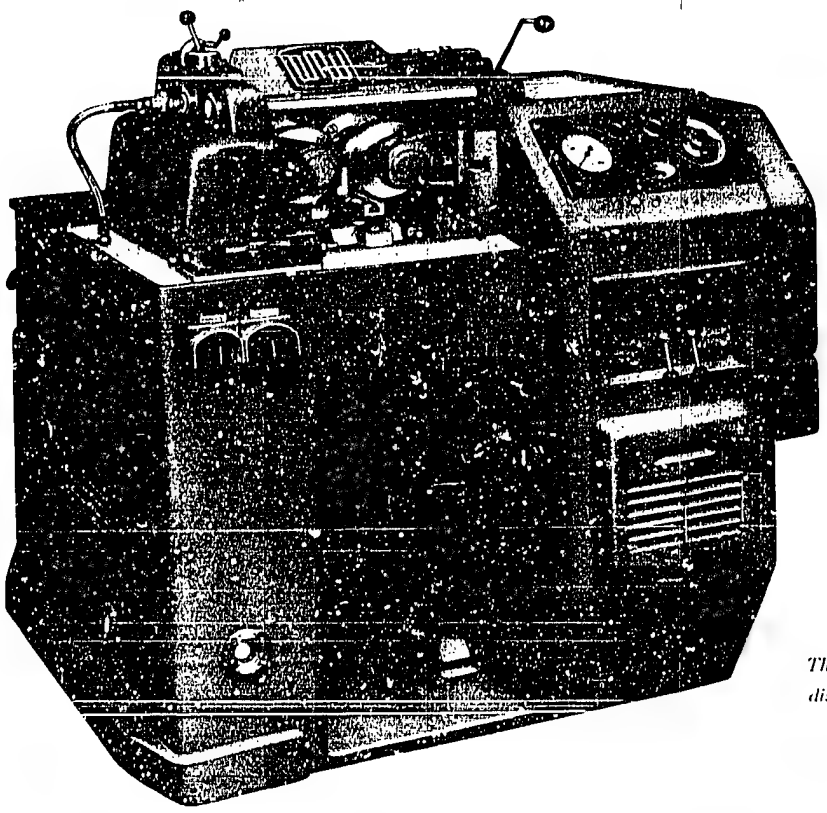
cutter head

Fly-cutter thread milling machine GSZ 60

THREAD ROLLING

Our thread rolling machines produce threads by the process of non-cutting shaping.

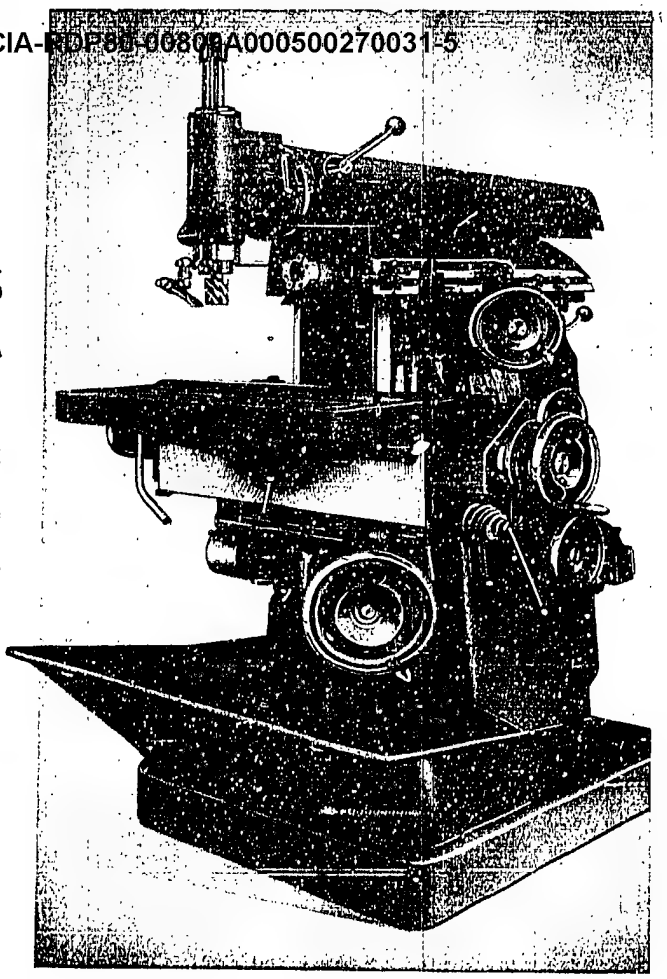
The range of capacity of our thread rolling machine GWR 80 comprises workpieces between 3 and 80 mm diam., and a rolling length up to 120 mm. Longer threads may be produced by the so-called axial feed process. In conformity with the length required, pitches up to 5 mm may be rolled. In consequence of the cold working, a higher wear hardening property is imparted to the flanks of the threads at an optimal saving of stock owing to the solidifying of the structure. The fibres of the material are not cut through, so that the thread withstands a higher strain. By the simultaneous action of the tools along the whole length of the thread very low piece times are obtained.



Thread rolling machine with disc-shaped rollers

UNIVERSAL TOOLROOM TYPE MILLING MACHINES

MODEL DUPLEX-59 ORIGINAL RUHLA



The universal toolroom milling machine model Duplex-59 Original Ruhla corresponds in its design to the famous universal toolroom milling machine model Duplex-58. It has, however, a more rugged construction, longer working travels, and a higher production capacity. Thus model 59 represents the necessary further development of model 58 by having the same universal field of application as the latter, and giving the possibility to machine heavy workpieces. The machine model 59 has a compact and quiet outward appearance. In order to guarantee the utilization of modern carbid tools, special attention in the design of the machine has been paid to the ruggedness and rigidity of the column of the machine.

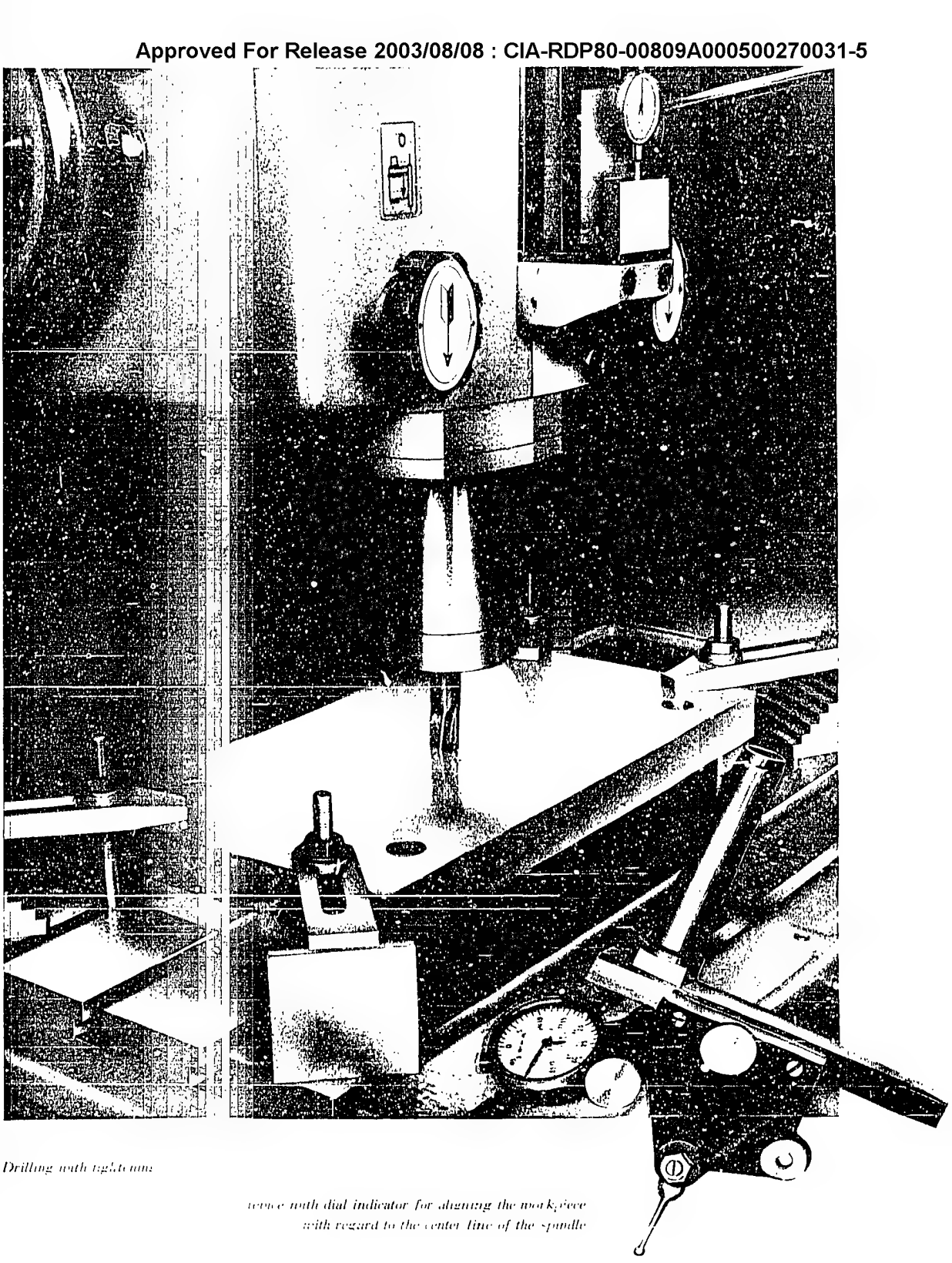
There are 8 spindle speeds in geometrical progression available; 52 to 1200 r. p. m. for the horizontal spindle, and 80 to 1200 r. p. m. for the vertical spindle.

The control of the main gear mechanism and of the feed gear mechanism with 8 feeds and individual drive is accomplished by cam control (single handwheel control). The head is driven by a three-phase current motor having 2,2 kw power, and the feed gearing by a motor having 0,63 kw power. All spur gears of both gear mechanisms are hardened and have ground tooth flanes.

The front bearing of the horizontal spindle is an adjustable plain friction bearing, whilst for the rear bearing anti-friction bearings are incorporated.

The vertical milling head is mounted on theram type overarm and may be swivelled by 360 degrees. For horizontal milling operations the head is not taken off, but brought into a horizontal position, in order to move back the overarm. The motion of the control organs corresponds to the respective motiors of the slides, and ease and handiness of operation is ensured by the centralization and ingenious arrangement of all operating elements. The power rise and fall traverses of the vertical slide as well as the right and left traverses of the longitudinal slide are operated by one control lever only. A new design of angular V-guides for the longitudinal slide ensures a high working accuracy, even under severe service conditions. The nose of the horizontal spindle is designed to receive an ISA-steep angle taper $1^3/_4$", and the nose of the vertical spindle an ISA-steep angle taper $1^1/_4$".

The field of application covers precision milling work, besides inside turning operations and boring operations as required by the tool and jig manufacturing shop. An outstanding feature of the newly-developed universal toolroom milling machine model Duplex-59 is its versatility which is still increased by a lot of practical special attachments.

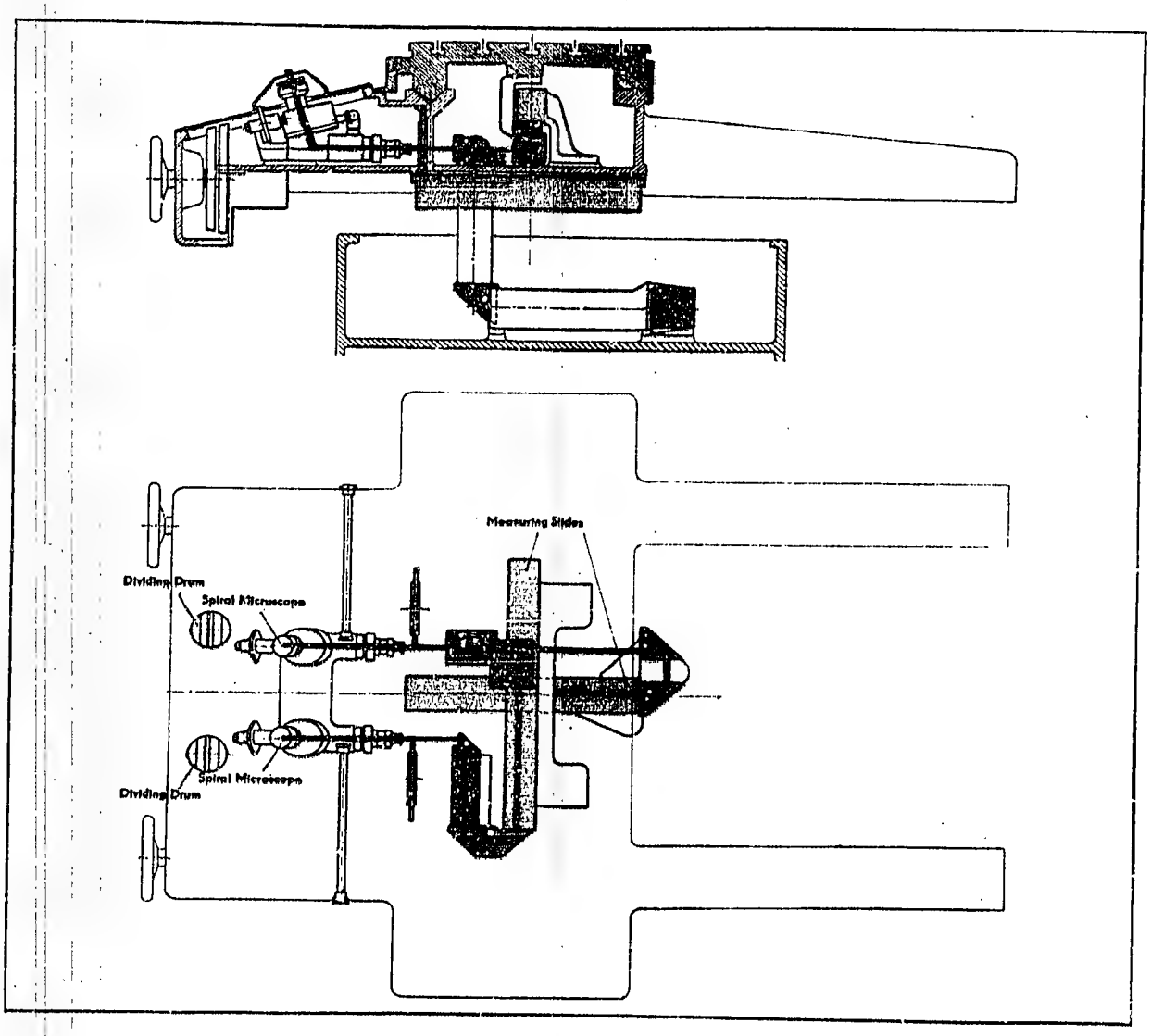


Drilling with right-angle

screw with dial indicator for aligning the workpiece with regard to the center line of the spindle

JIG AND GAUGE BORING MACHINE

SCHEME OF THE OPTICAL MEASURING UNIT



JIG BORING MACHINES

column and box type upright drilling machines
box type gang drilling machines
fineboring machines and fine boring units
horizontal boring, drilling and milling machines

JIG BORING MACHINE BL 315 x 450

The ever increasing demand for high-quality gauges, jigs and precision component parts for the requirements of modern duplicate production in machine building, and also for mass production, have led to the development of a jig boring machine according to the latest researches and experiences. The new jig boring machine surpasses all systems known up to this day with regard to its measuring and working accuracy. A special feature is the combination of a coordinate measuring machine having optical fine-measuring devices and a precision and fine boring machine. The control of the machine is fully centralized so that all control levers are conveniently operated, and adjustable from the operator's stand. For machining small workpieces the operator may also be seated. By special arrangements in the design of the machine, errors caused by setting are eliminated. There is no need for the operator to carry out calculations, such like summing up of measures.

THE OPTICAL MEASURING SYSTEM

The measuring system applied affords a direct reading on the glass scale and rack type adjustment. In opposition to the measuring system with screw adjustment, it has the advantage of being resistant to wear. The displacement of the measuring slides is read off by means of spiral microscopes and reversing collimators on glass scales having 1 mm-graduations.

The subdivision of one millimetre ensues in the spiral microscope by rotating a spiral plate, permitting thus to read off one μ of a millimetre. In order to eliminate tilting errors, which are unavoidable after a certain wear of the machine, the Eppenstein principle has been adopted, so that for the whole life of the machine and for a medium machining plane of the workpiece the working accuracy is guaranteed. By these means the principle of Abbe which demands "measuring in the respective measuring plane" is approximately complied with. For a working height of 138 mm above level of table the principle of Abbe has been attained. In order to avoid any mental calculation work from the operator's part, an absolute zero position of all measuring organs at the beginning of the operations is possible.

The millimetre dividing drum for the coarse adjustment may be positioned to zero at any point before beginning the operations, i. e. after clamping the workpiece and aligning the latter by means of the setting microscope or centering device. The spiral microscopes, too, have a device for the zero position and avoid, therefore, calculation work.

If the measurements in the drawings are entered by means of the coordinate system, the direct arithmetical value may be used as value for setting. Together with the coarse millemetre scale, another coarse scale has been coupled which indicates the respective final position of the table. By this method the mounting of the workpiece at the right point of the table is facilitated. Switching on the microscope and scale illumination is done by a push button at the control desk. A time relay incorporated in the machine switches off the illumination after approximately 20 seconds, minimizing thus an undesirable heating of the measuring tools. All lamp sockets are easily accessible from without, and exchange may take place within a few seconds.

The circular dividing tables (special attachments)

The machine is equipped with a rich standard attachment and guarantees, therefore, an adequate utilization for all operations that may be met with in the shop. The flexibility of the machine is still heightened by special arrangements, of which latters the two circular dividing tables are worth mentioning.

The circular indexing table 300 mm diam.

The circular indexing table is running on balls and, therefore, adjusted with great ease. Indexing is done by means of a globoidal worm and a worm-wheel. A correcting device has been incorporated for eliminating pitch errors. The globoidal worm is of the swivelling type and facilitates thus a quick rotating movement of the table during the alignment. The precise setting ensues through a micro setting knob, and both the scale and the vernier are illuminated. By an equalizing single-lever device the table is clamped on two points at any of its positions.

The circular indexing table has a graduation of 360 degrees for coarse reading. In order to avoid errors in calculating, the indexing drum can be set to its zero position. It has to be reminded that the measurements for the workpiece have to be entered into the drawing according to the coordinate system. Mandrels are fixed by a Morse cone No. 2.

Chief specification

Diameter of table in mm	300
Height of table in mm	120
Coarse reading in degrees	1
Fine reading in seconds	2
Accuracy of dividing in seconds	5
Weight of table in kgs.	55
Admissible load of table in kgs.	30
Space required by table (width × depth × height) in mm	500 × 400 × 120

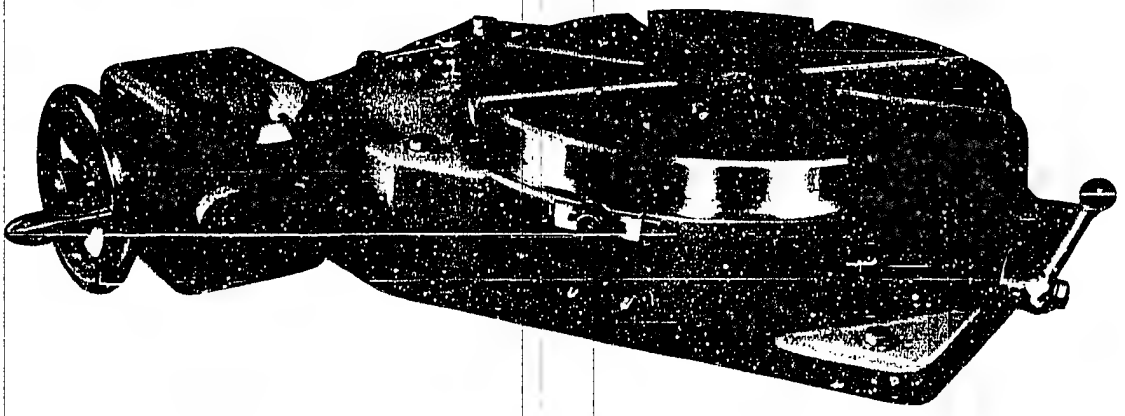
The tilting type circular indexing table 180 mm diam.

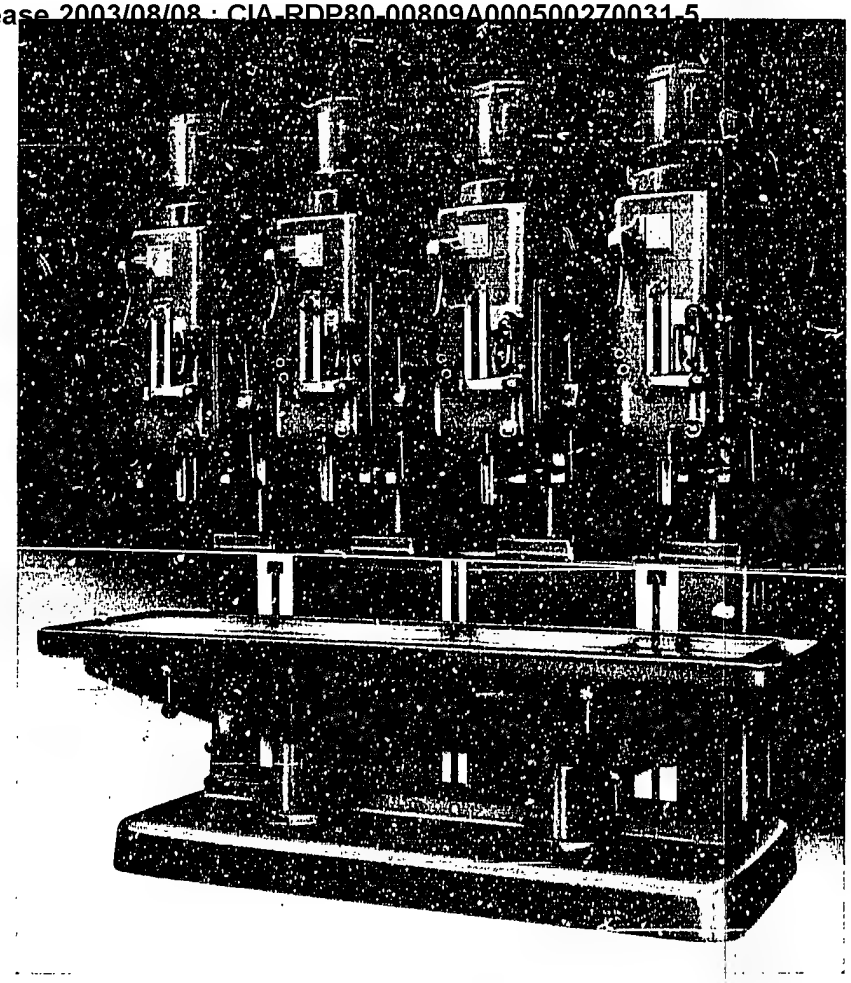
The tilting type circular indexing table is essentially meant for the boring of workpieces or jigs that require machining from more than one side. In opposition to the plain circular indexing table, the tilting type model has gliding bearings. This kind of bearing can be applied on account of the small size of the table. The circular indexing table rotates through handwheel, globoidal worm and worm wheel. A correcting device serves for eliminating pitch errors. The globoidal worm is of the swivelling type allowing thus a quick revolving of the table during the alignment. Fine adjustment is accomplished by means of a micrometer setting knob, and is read off on an illuminated scale and vernier.

The tilting movement of the circular indexing table can be coarsely adjusted from the horizontal plane up to 90 degrees by means of a handwheel with a scale. The fine adjustment is accomplished through a micrometer setting knob and a new measuring device which allows an accurate reading of the tilting motion up to 10 seconds. Applying a small number of parallel gauge blocks, the values for the angles are set by a dial indicator with μ-indexing, referring hereby to an annexed table. The clamping device being a positive one, the settings are maintained without error till the respective operation has been terminated.

Chief specification

Diameter of table in mm	180
Height of table (horizontal position)	165
Coarse reading of rotation angle in degrees	1
Fine reading of rotation angle in seconds	5
Coarse reading of tilting angle in degrees	1
Fine reading of tilting angle in seconds	5
Weight of table in kgs.	41
Admissible load of table in kgs.	20
Space required (width × depth × height) in mm	415 × 415 × 166





Gang upright drilling machine with box type columns model BKR 4×25/1

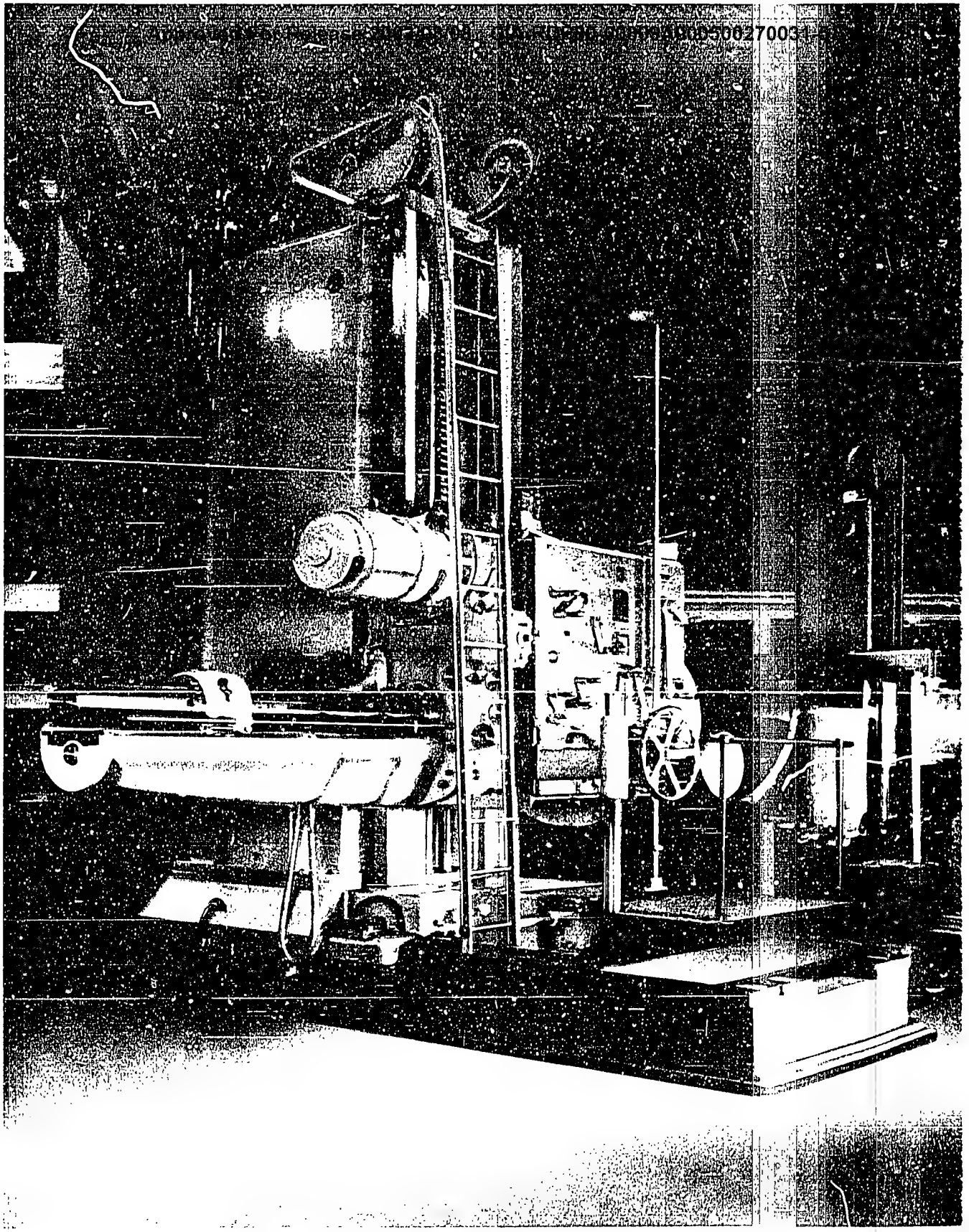
UPRIGHT DRILLING MACHINES WITH ROUND AND BOX TYPE COLUMNS GANG UPRIGHT DRILLING MACHINES WITH BOX TYPE COLUMNS

The standardization of the drilling capacities 16, 25, and 40 mm has been carried out in the design of upright drills with round and box type columns, and of gang uprights with box type columns, by employing the same driving units both for the single spindle uprights with round and box type columns and for the multi-spindle gang uprights with box type columns. For the 16 mm capacity machine the range of the single spindle designs is restricted to round column type uprights, a bench type machine being additionally provided for. The machines are fitted for all kinds of drilling, boring, countersinking, milling, reaming, and tapping operations within their range of capacity. The design and construction are based upon modern engineering thoughts, whereby special attention has been paid to the ease of operation and a foolproof arrangement of all operating elements. The drillheads of each model form a unit with the respective drive, and may be vertically displaced on the bearings of the column. The capacities indicated are valid for continuous operations without danger of overload. Outstanding advantages are, besides quiet and vibrationless running,

single lever control for the spindle speeds and feeds.
single lever control for starting and switching off the motor and right-hand and left-hand running for tapping operations,

a wide speed range to obtain economic cutting speeds for the divers materials, diameters to be drilled, and machining operations,

ease of engaging and disengaging the automatic feeds, and, finally, the automatic stop with adjustability for limiting the depths of the holes to be drilled.



Horizontal table and floor type boring, drilling, and milling machines

The BFT-table type models and BFP-floor type models differ from one another by the stationary column, the vertically adjustable boring head and the compound rotary table for the first ones, and by a movable column, boring head with vertical adjustment and a fixed bedplate for mounting the work in the case of the floor type boring, drilling and milling machines. Boring, drilling, and milling machines are modern shop equipment machines, and are utilized for a variety of boring, drilling, milling, or tapping operations into any material. They are, therefore, very versatile machines.

Horizontal boring, drilling, and milling machines — table type models

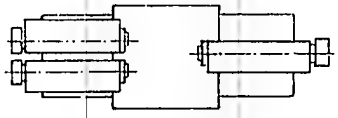
	BFT 63	BFT 80	BFT 100	BFT 125
Diameter of spindle in mm	63	80	100	125
Feeding stroke of spindle in mm	560	710	900	1120
Additional feed of spindle in mm	280	355	450	560
Working surface of revolving table in mm	710 × 900	900 × 1120	1120 × 1250	1400 × 1600
Traverse of table parallel with spindle in mm	1060	1250	1650	2100
Traverse of table transversely to spindle in mm	800	1000	1250	1600

floor type models

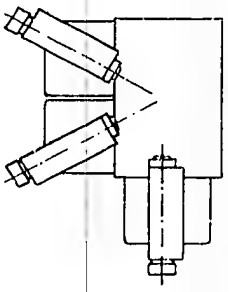
	BFP 100	BFP 125	BFP 16[illegible]	BFP 180/200
Diameter of spindle in mm	100	125	160	200[1])
Feeding stroke of spindle in mm	900	1120	1400	1500
Additional feed of spindle in mm	450	560[2])	700[2])	750[2])

[1]) Diameter of spindle 180 or 200 mm optionally. [2]) Only for models without high-speed internal spindle.

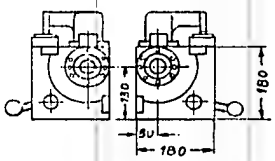
Illustration close by:
Floor type horizontal boring, drilling, and milling machine BFP 125 with swivelling platform and ladder



Plan view



View of spindle nose



FINEBORING UNITS

The development of fineboring units has followed the path of the constructional unit system, so that other single purpose machines for heavy workpieces, or quickly convertible universal single or multi-spindle machines for series production, are available from the constructional elements.

The fineboring unit consists essentially of a square-sectioned main body, the feed sleeve of which has been arranged eccentrically with regard to the spindle, so that the smallest distance between centres (110 mm) is obtained by using two boring units with left and right-hand arrangement.

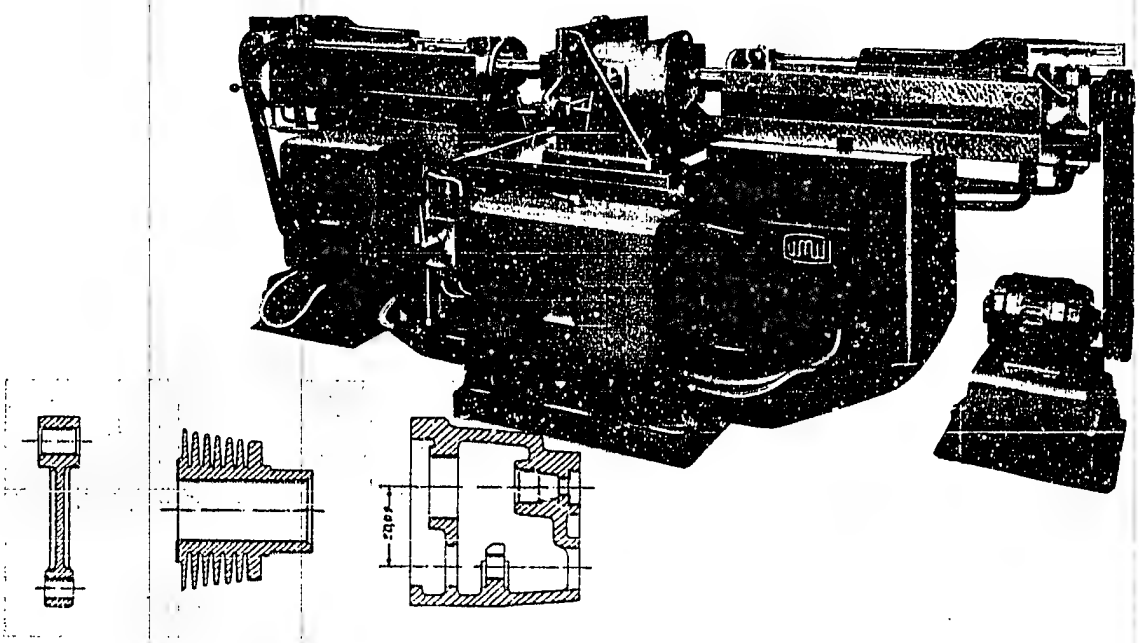
The feed motion of the feed sleeve together with the spindle is a hydraulic one, and has an infinitely variable control between 10 and 200 mm per minute. The maximal feeding stroke amounts to 200 mm. The stroke is limited by a finely adjustable positive stop which can be easily exchanged. The quick motion feed and reversing stroke amount to approx. 2 metres per minute. The control of the feeding movement ensues through an incorporated controller and a control jack. By transposing the control members, every boring unit can be converted from left-hand arrangement to right-hand arrangement, and vice versa.

In order to maintain the small play of the adjustable friction bearings of the spindle, a circulation system has been applied for the spindle. The circulation of the lubricant is hereby watched through an inspection glass.

When utilizing fineboring units for single purpose and for universal machines, columns are usually employed that have one or more vertically adjustable knees to receive the units, each of which possesses an individual drive. The assembling of single purpose and universal machines from single constructional elements by means of the constructional unit system and the utilization of bottom drives facilita e the arrangement of fineboring units in any position required by the workpiece, amongst others also angular positions and, in special cases, also a vertical arrangement.

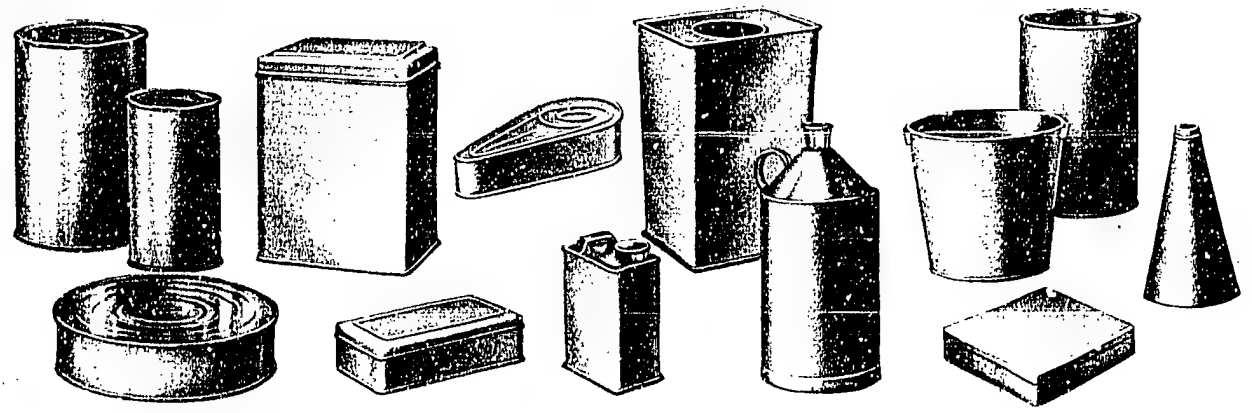
These possibilities may still be widened by the use of drilling units and, if necessary, of facing units.

The control and operating members are conveniently arranged, so as to be at the reach of the operator.



MACHINE TOOLS FOR NON-CUTTING SHAPING

High production machinery for the manufacture of all kinds of sheet metal packings and containers, and for general sheet working



MACHINES AND EQUIPMENTS FOR THE MANUFACTURE OF SHEET METAL PACKINGS

Sheet metal packings are made in a variety of kinds, and may be subdivided by the various machines and equipments necessary for their manufacture as follows:

tins, round and other shapes, for meat, fish, milk, vegetables etc.

plain tins for turned-up or hinged lids for cocoa, coffee, cakes, chocolates, and sweets,

canisters of all shapes and sizes for mineral oils, benzine, and vegetable oils,

round containers with pressed-in lids or with screwed caps for liquid or granulous contents,

buckets having cylindrical or conical shapes.

This subdivision is restricted to the principle shapes, and may be considerably extended.

The manufacture of the plain tins having a stuck-in or turned-up lid is usually accomplished in 2 operations (blanking/drawing and trimming/beading operations). All the other tins, however, are made of several component parts, and require, therefore, a whole sequence of metal working machines. On the other hand, the type and number of these machines depend upon the shape, size, and design of the metal packings to be manufactured and the hourly or daily output wanted. In conformity with a small, medium, or great output, and the kind of tin in question, very different machine plants will result.

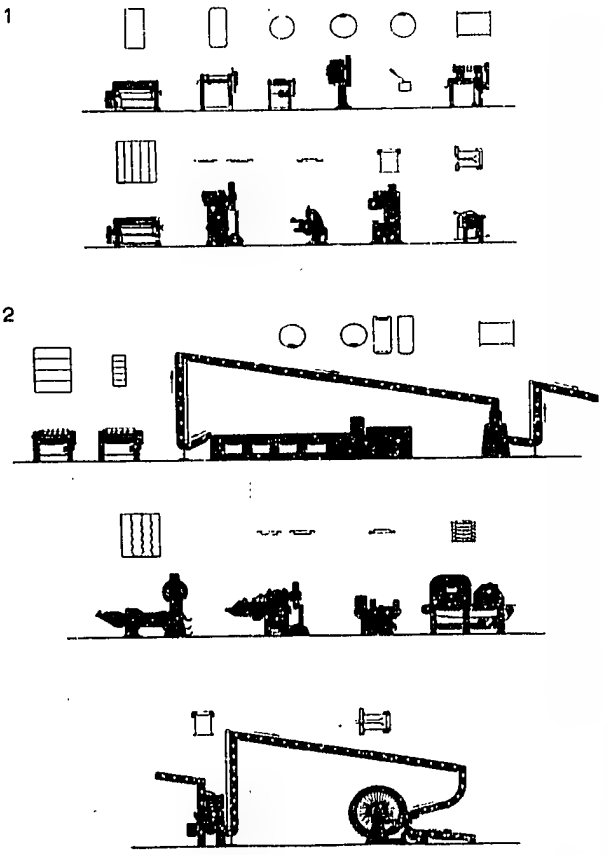
Example for a range of productive capacities (in pieces per hour):

	small output	medium output	high output
preserve tins	600 to 1000	6000 to 7000	15000 to 18000
canisters, 5 litre contents	250	375	750
round containers, 100 to 200 litre	20	40	80

The process of manufacture even for the most divers tins, canisters, round containers etc. is basically the same, yet very different machines are required due to the size, thickness of the strip and to the production capacity required. Irrelevant to the kind of container, the following operations and types of machines have principally to be taken into consideration:

cutting out the body from a sheet of metal, or slitting the sheet into strips for drawn tins	shears
notching of the corners of the cut	corner notching machine
bending of the seam hooks	bending machine
rounding and shaping of the body	rounding or body rolling machine
longitudinal seaming, overlap soldering or welding (if ordinary black sheet steel)	seaming, soldering, or welding machine
re-soldering of the longitudinal seam to obtain a hermetical closing	
beading of the body of large tins, containers, and the like	beading machine
flanging of the body ends	flanging machine
slitting of strips for cutting out the bottoms and the covers or lids	shears
blanking, drawing and embossing of the lids and bottoms	press
bending	bending machine
providing with solution tightening material, and drying, or	solution tightening machine and dryer
tightening with rubber string	
seaming on the bottom	bottom seaming machine
testing for air-tightness	air pressure tester
blanking, drawing and trimming of drawn tins	press
seaming on the lid	lid seaming machine

With respect to the opening of cans or round containers, lids that are pressed-in and thus give a firm closing, must principally be distinguished from lids that are screwed in. The number of operations and equipments required can, therefore, only be ascertained according to the circumstances.

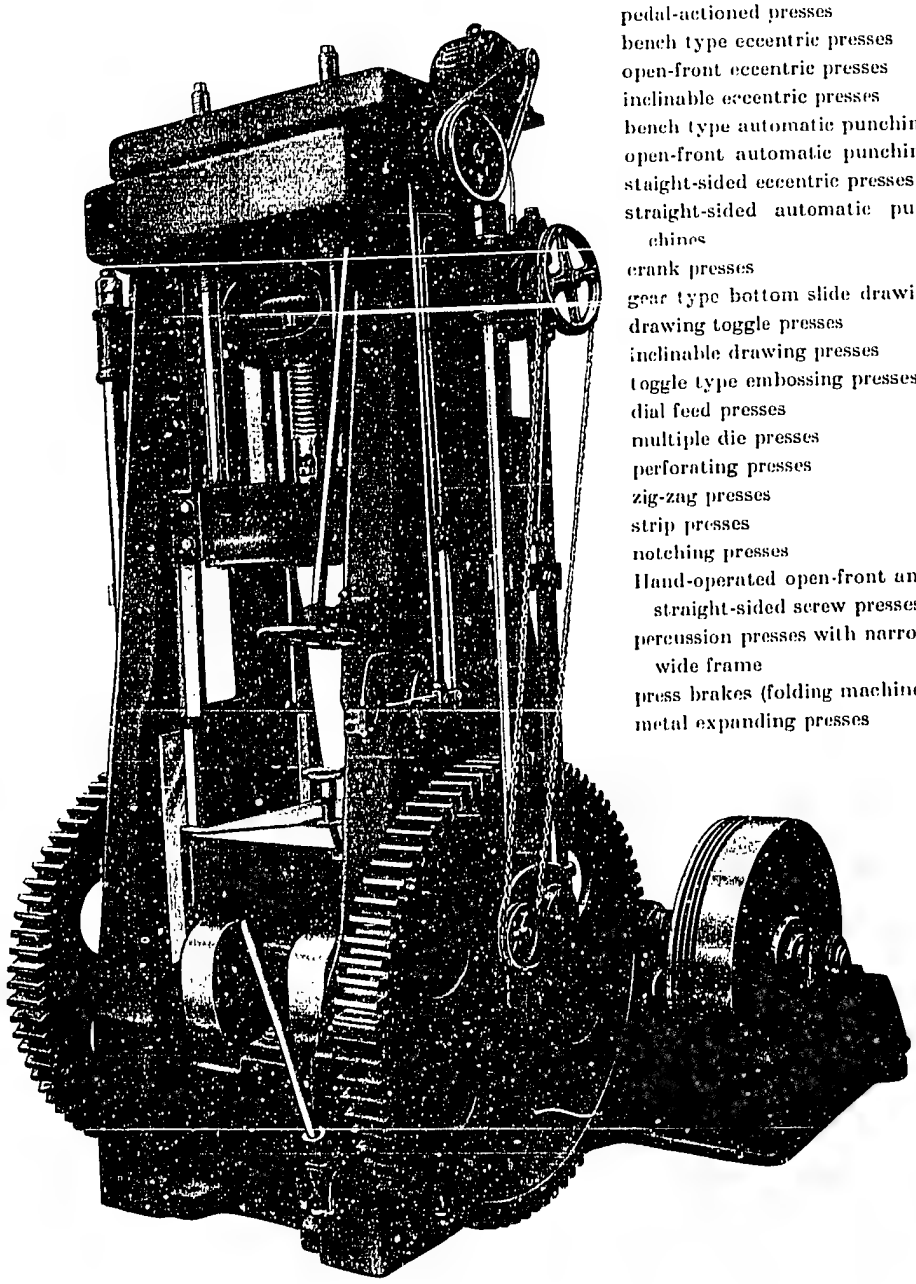


Scheme of a plant having:
1) a small output
2) a high output

These few examples show that in spite of the similarity of work very different machines are employed in keeping with the output. This is explained by the fact that for low outputs most of the operations are executed by hand, whilst for a high capacity plant nearly all operations are automatized. The assembling of such a plant depends, however, not only on the amount of output, but also on the constructional details of the metal sheet packings to be manufactured. Thus preserve tins may have round, round-cornered, sharp-cornered, oval or other shapes, furthermore they may be manufactured by drawing, or have longitudinal seams, etc. It is also essential whether the tins must be absolutely airtight, or only watertight, or whether the contents is but pulverulent or granulous.

In order to comply with all these demands it is indispensable for an economical production that machines conducive to that end are employed, whereby attention must be paid to the working problems to be solved. In spite of all useful standardizing endeavours, yet a successful production of the divers articles cannot be carried out without the help of special machines. If such articles are required, it is, therefore, necessary to state the desired output, besides sending in drawings or patterns These data form the basis for our offers of machines or plants best fitted for the purpose.

MACHINES FOR GENERAL METAL WORKING



Presses:

pedal-actioned presses
bench type eccentric presses
open-front eccentric presses
inclinable eccentric presses
bench type automatic punching machines
open-front automatic punching machines
staight-sided eccentric presses
straight-sided automatic punching machines
crank presses
gear type bottom slide drawing presses
drawing toggle presses
inclinable drawing presses
toggle type embossing presses
dial feed presses
multiple die presses
perforating presses
zig-zag presses
strip presses
notching presses
Hand-operated open-front and straight-sided screw presses
percussion presses with narrow and wide frame
press brakes (folding machines)
metal expanding presses

Shears

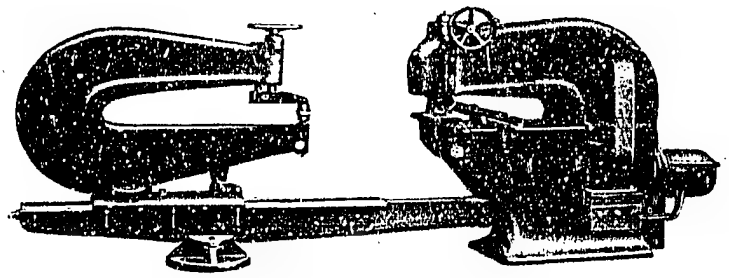
guillotine shears
circular shears
strip cutting shears
gang slitting shears
combination shears
coping shears

Bending machines

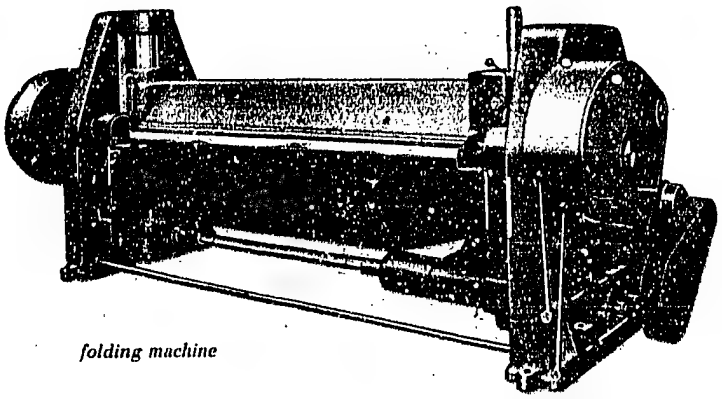
rounding machines
folding machines
sheet straightening machines

Machines for plumbers' and tinsmiths' equipments

Rolling machines



circular shears

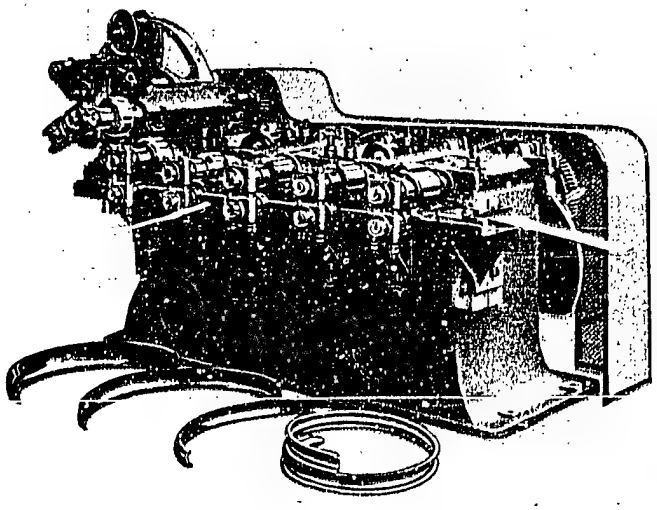


folding machine

SPECIAL MACHINES

Multiple-roll profiling machines

are equipped with 4 or 6 pairs of rolls. By applying the correspondent rolls and attachments, the most diversified profiles can be produced at ohne pass. With the aid of special attachments these profiles may simultaneously be rounded, if so desired.



Thread rolling, trimming, and beading machines

These versatile special machines are universal types, and may be optionally employed for

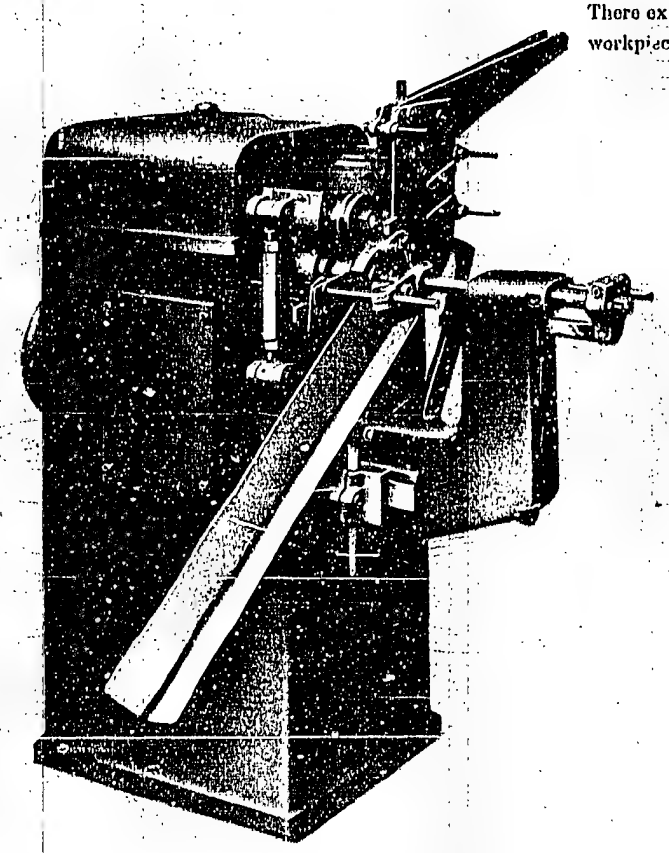
semi-automatic operations
(for all parts that cannot be fed automatically),

high-speed operations
(for high outputs per minute and for light workpieces made of thin sheet metal),

low-speed operations
(high pulling power, working of thicker sheet metal),

optionally semi-or full automatic operations
(for all workpieces the shape of which requires said operations).

The outstanding advantage of the new design is explained by the fact that the machine may be set at any time for one of the above mentioned operating methods.
There exists also a semi-automatic model for heavy workpieces up to 1 mm thickness of the sheet.



HYDRAULIC PRESSES

From the extensive range of hydraulic presses (single column presses, double and four-column presses, drawing and stretching presses, embossing presses, presses for synthetic plastics, presses for sets of wheels, drawing presses) the following specification refers to presses for synthetic plastics.

Presses for synthetic plastics with mechanical ejector (hand-controlled) with pressure capacity 20 to 100 tons

These models are special presses for pressing plastic products (thermosetting compounds) of the types S, Z, T and others. As controls approved control boxes are employed.

Presses for synthetic plastics with hydraulic ejector (hand-controlled) with pressure capacity between 250 and 400 tons

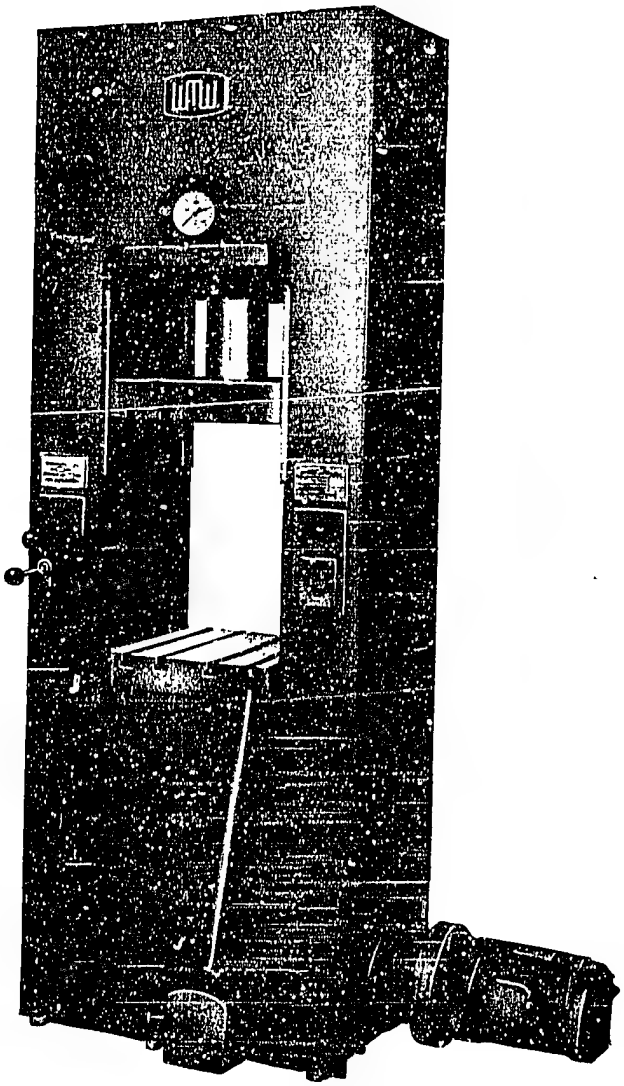
These models are intended for pressing and die pressing of plastic materials (thermosetting compounds). They are equipped with a duplex control 1 VSK. The presses can be succesfully employed for the manufacture of articles made from sintered products.

Presses for synthetic plastic materials with hydraulic ejector (full automatic type presses) with a capacity of 160 to 2000 tons

The automatization which has been incorporated in these newly-developed presses guarantees a full utilization in the sequence of the single operations. The full electrical control is perfectly assimilated to the manual work and guarantees a high working accuracy.

The presses can be applied to the following operations:

1. Full automatic pressing and ejecting.
2. Automatic pressing and ejecting by hand.
3. Pressing and ejecting by hand.
4. Full automatic die pressing.

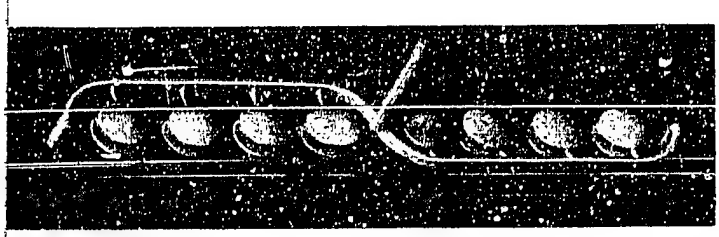


Presses for synthetic plastics model 20 KPS

For the setting of the mould a finger touch type control has been provided for, so that a sensitive working is ensured, whilst undesirable incidents during changing the moulds are eliminated.

TOOLS FOR NON-CUTTING SHAPING

Blanking, drawing, bending, and embossing tools, pressing tools, pressure die-casting tools, tools for pressing layer materials, pressure die-casting dies (injection moulds) for thermoplastic masses, rubber moulds, press casting moulds, brass forging dies



Die-casting specimen

Blanking, drawing, bending, and embossing tools

Our range of manufacture of small tools comprises blanking, drawing, embossing and bending tools, moulds for hot-pressing, single blanking dies, multiple blanking dies, engraving dies for the cutlery and hardware industries, and tools for multiple-die presses for non-cutting shaping. Heavy tools are made up to the largest dimensions as blanking, drawing, bending, and stamping tools for the vehicle and body building industries, for the manufacture of hearths and other articles. When encountering any problem regarding the mass production of articles made by cutting, drawing, stamping, or punching operations, and the manufacture and supply of tools belonging to them, it is indispensable to bear in mind the working conditions prevailing.

Pressing tools, tools for pressing layer materials

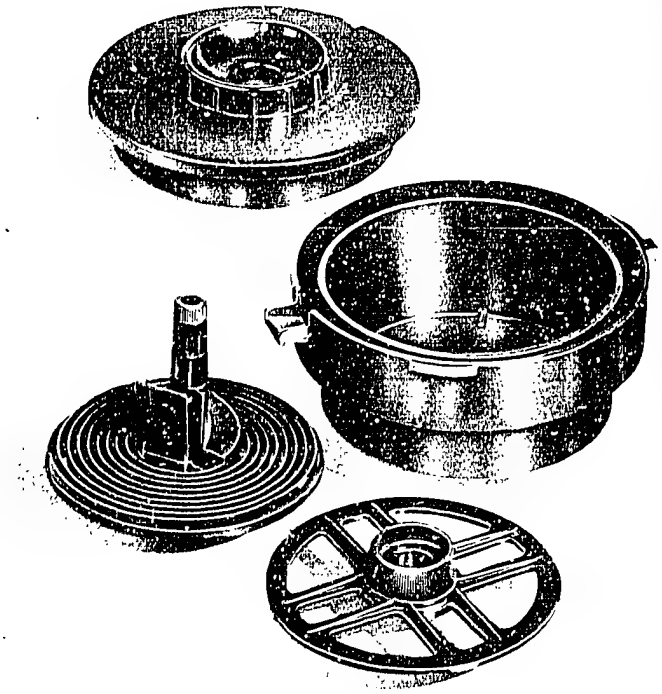
Pressing tools are made as single or multiple moulds. The size of the tools depends upon the article to be manufactured, the demand required, and upon the presses employed. Our range of manufacture comprises tools for pressures between 10 to 500 tons and for workpieces with a weight up to 4000 kgs. We guarantee an outstanding quality for the pressing moulds and dies manufactured. Thus the inner parts which come into contact with the moulding compound are made of high-quality steel with a high degree of purity, and are free from shrinkages. The surfaces of the die must be as hard as glass, resistant to wear, and mirror-finished. When employing case-hardening steel, the case must be 0,5 to 1 mm deep.

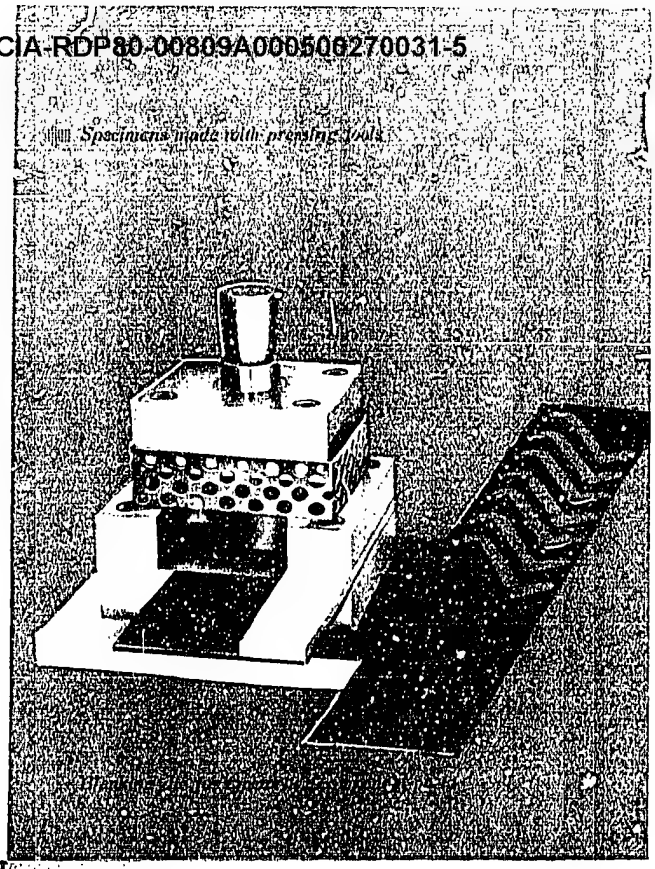
If the tools are treated carefully, a single type mould will have a life of approximately 40000 to 50000 pressed parts, and that of a multiple die will even last correspondingly longer. The heating of the die ensues electrically or by hot water. Unobjectionable parts can only be guaranteed, if the prescribed temperatures and the required pressures are maintained and if the dies undergo a careful control and maintenance. The control of temperature is carried out by a regulating device, and the setting of the prescribed initial temperature by melting salts. Thus, for instance, 160 to 170 degrees C must be maintained for the working of a rapid moulding compound. Consequently, a tolerance in temperature up to 10° C is admissible. If the moulding material is acidiferous, the tolerance in temperature must not exceed 2 degrees.

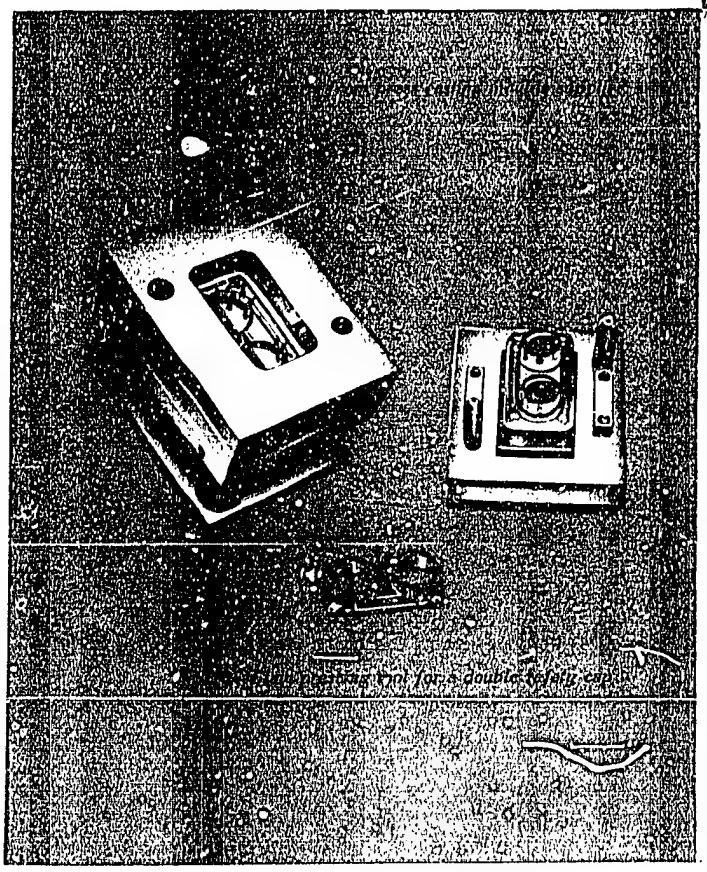
In order to obtain a maximum life of the die, and to guarantee the scheduled output, the calculated working pressure has to be kept within close tolerances. The plunger of the press is provided with outlets for the moulding compound to flow off, or it has a correspondent play, so that an overpressure is avoided by the superfluous quantity of moulding material escaping.

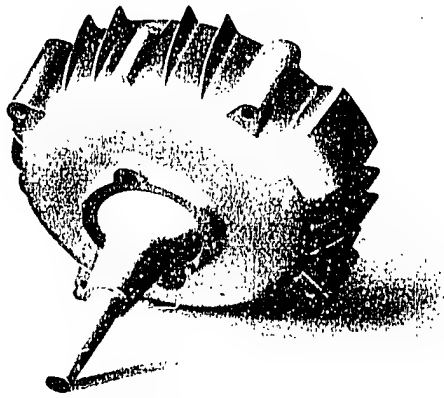
At the beginning of the work attention must be paid to paint the heated die with die wax, until the pressed parts can be detached from the die without difficulty. Remnants of the moulding compound, or of the pressed parts sticking to the die, should only be removed with a piece of pointed round brass.

The die is filled with loose moulding compound, or with tablets. If the plastic product is acidiferous,









the die must be made either of acid-proof steel, or it must be hard chromium plated. The latter process has proved the most advantageous up to now. Which steels are to be employed, depends upon the kind of moulded plastic, since the latter varies in the working pressure between 250 and 800 kg/cm/. These pressure conditions have, therefore, to be taken into account when designing the dies. Finally, attention must be paid as to whether the pressed part has the shape of a plate or vessel with a considerable rise, because the shape of the parts to be manufactured also greatly influences the pressures applied.

Pressure die-casting tools

are employed for parts with thick walls or with many or thin metal inserts. For these dies the plastic compound is filled in loosely, or in the form of tablets, into a feeding cylinder and having reached the necessary temperature, is pressed at one pressure through one or more nozzles into the cavity of the die. The advantage of this process lies in the fact that the compound will increase in hardness very quickly, so that the very short piecetimes obtained guarantee the profitableness of this working process.

Pressure die-castings with thick walls

As an example let us look at a telephone receiver. Such a receiver is made with the aid of a duplex pressure die-casting die within 1 or 2 minutes, using tablets which have been preheated in a high-frequency preheater. The press moulding process requires for the same part two press moulds, namely one for pre-moulding the profile tablets, and a finishing mould for the receiver proper. The production time per piece for the manufacture of the receiver by this process was aprox. 6 to 8 minutes, from which the advantage of the first-mentioned pressure die-casting die is evident.

Pressure die-castings with many or with thin metal inserts

These complicated parts cannot be manufactured oftentimes by press moulding, whilst there are no difficulties when applying the pressure die-casting process, because the metallic parts can be laid in at first very conveniently, and then the moulding compound is pressure cast through the nozzle without endangering the metal.

There are pressure die-casting dies for presses with top and bottom type plungers. The working process is for both types the same. For the top type model the moulding compound is poured from above into the filling cylinder, the plunger moves from the top towards the bottom, and theram performs the working process closing at the same time the die. The bottom type model has the die filled in the same manner, the closing of the mould, however, is performed by the ram,and the die-casting operation by the plunger of the press.

Pressure die-casting tools are made for pressures not exceeding 1200 kg/cm² (17000 psi). These calculations result in a normal die-casting process with the necessary times for hardening and setting. The larger the section of the nozzle is chosen, the smaller will be the surface pressure, the longer, however, the above mentioned times. As the hardest wear is to be stated at the contours of the nozzle, a material must be employed which is resistant to wear, or a case-hardening steel with a thick case. If possible, the contours of the nozzles should be arranged interchangeably and be made of super-speed steel or of cemented metal carbid. The maintenance and operation of the pressure die-casting die has to be carried out with the same care as for the usual pressure moulds.

Press tools for working layer materials

are employed for the working of layer materials (plywood impregnated with resin). The material to be pressed is piled up in plates, and then laid into the mould. It is then pressed under high pressures and simultaneously cut off.

Press tools for working layer materials are made of special quality case-hardened steel. Special experiences are needed for the design of the cutting edge.

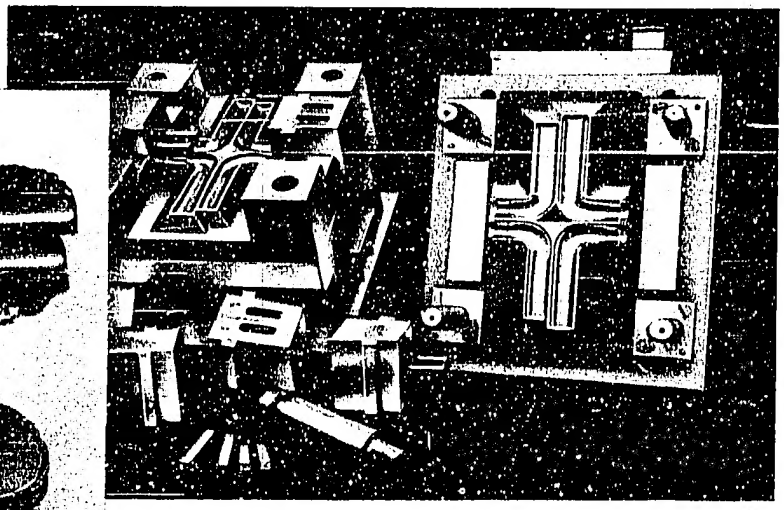
Injection moulding dies for thermoplastic compounds

As is usually known, the material for thermosetting compounds has to be filled into an open and heated mould. Thermoplastic masses, however, like Trolitul (Polystyrol), Luvican, Plexigum and others can be injection moulded. This process is characterized by the fact that the die is already closed before being filled with the plastic material. It is evident that by the elimination of any movement of the parts of the die during the moulding process the shaping facilities become greater.

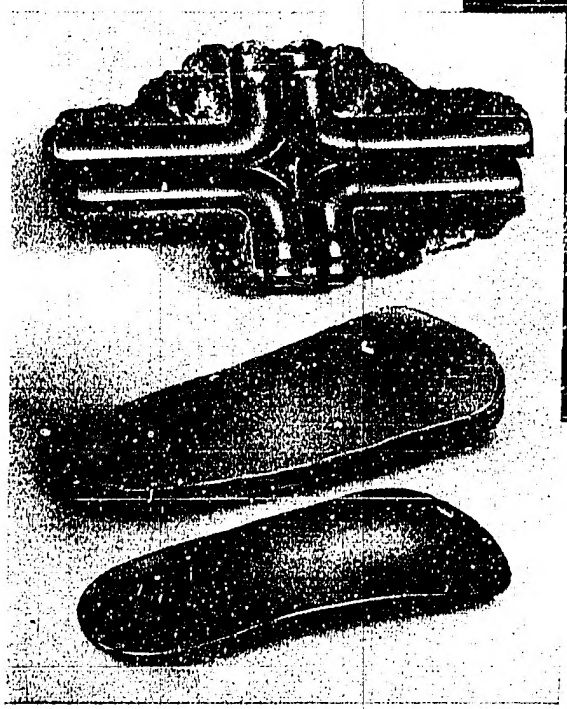
For injection moulding have been developed semi-automatic and also full automatic machines. The plastic material is molten in an electrically heated cylinder, and then injected by a plunger into the closed and water-cooled die. In opposition to metal pressure die-casting, the plastic material is not liquid when being cast.

In fact, the heating of thermoplastic materials is subjected to definite temperature limites, and the plastic product may easily decompose itself and decay, if these limits are exceeded. At the working temperature the moulding material is rather viscous, and possesses, therefore, a relatively high coherence. In consequence of this, very high pressures are needed for the plunger (for the most part over 1000 kg/cm², or 14000 psi), in order to guarantee the mass to be cast quickly into the mould, and to fill the latter completely, without cooling down on the way.

In course of time experiences have been gained to impart to the dies reliability of service, even for complicated moulding operations. As a rule, the die consists of the two moulding flanges and the moulding plates attached to them. The flange towards which the nozzle of the injection cylinder is directed, is known as the nozzle moulding flange, and the opposite flange which is moving back if the mould opens, is called the ejector moulding flange. These two moulding flanges receive the moulding plates proper. The plane which divides the mould or die is vertical with regard to the direction of injection. Both moulding plates are provided with channels in the form of holes or brazed-in little tubes for the passage of the cooling water. For high-quality moulding tools that are to have a long life the moulding plates are made of hardened tool steel which will not warp, or of hardened case-hardening steel. In order to comply with the demands of the practice regarding tightness of the mould, sizing, and automatic ejection, a high precision in the manufacture of the dies is indispensable. The injection dies are, therefore, very expensive, but considering the long service life of 100000 to more than 1000000 of injections, the first costs will always be redeemed.



Four-fold pressing tool for pressing door-handles from layer material (plywood)



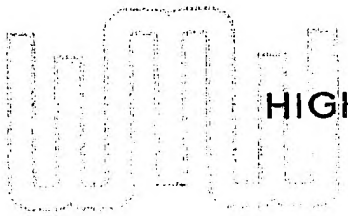
Pressed parts from tools for layer material (paper)

Sometimes dies which have no hardened moulding plates are used for small lot production. Apart from the considerable wear, the dies are often damaged owing to the very high pressures during injecting the compound which will leave in the course of time marks at definite points of the die.
The dies will vary condiderably, and depend upon the shape and size of the parts to be injection-moulded. They must, therefore, always be accomodated to the latters.

Rubber moulds, pressure casting tools, brass forging dies

Rubber moulds are made for mass production or as single moulds for larger workpieces and are not hardened, because the pressures wanted do not exceed 200 kg/cm² (2800 psi). The heating of the tools is accomplished by hot water, or electrically.
Pressure casting tools
are developed in conformity with patterns, drawings of the parts, or drawings of the moulds. Only alloyed high-quality steels for hot working with a high drawing (tempering) temperature up to 600 degrees C (1100° Fahrenheit) can be employed, because an annealing of the tool due to its getting very hot during the operations must be prevented.

Brass forging dies are also made of alloyed high-quality steels for hot working, in the same manner as the above-mentioned pressure casting tools.



HIGH PRODUCTION MACHINE TOOLS

DEUTSCHER INNEN- UND AUSSENHANDEL

WERKZEUGMASCHINEN UND METALLWAREN

Machine Tools from Our Manufacturing Program

Planing Machines, Slotting Machines, Die Slotting Machines

Planing machines for short work
Planing machines for long work of single and double column construction
Horizontal slotting machines (shaping machines) mechanical and hydraulical
Vertical slotting machines mechanical and hydraulical
Key way planing machines
Die slotting machines mechanical and hydraulical

Milling Machines

Horizontal milling machines
Vertical milling machines
Universal milling machines
Surface milling machines
Longitudinal milling machines
Thread making machines
Copy milling machines
Tooth facing machines

Turning Machines

Mechanic's lathes
Plain lathes
Sliding and screw cutting lathes
Multiple lathes
Relieving lathes
Vertical turning machines
Lathes with horizontal face plate
Roll turning lathes
Finishing lathes
Turning, drilling, and slicing machines
Centering and broaching machines
Turret lathes
Automatic turret lathes

Grinding Machines

Circular grinding machines
Horizontal surface grinding machines
Vertical surface grinding machines
Horizontal surface grinding machines with round table
Vertical surface grinding machines with round table
Key way grinding machines
Circular internal grinding machines
Centerless circular grinding machines
Optical profile grinding machines
Tooth face grinding machines
Tool grinding machines
Crank shaft grinding machines
Cam shaft grinding machines
Thread grinding machines
Other grinding machines
Honing machines
Straightening and polishing machines for round steel bars

Drilling Machines

Gauge drilling machines
Drilling units
Fine drilling machines and units
Table drill presses
Upright drill presses
Radial drilling machines
Multiple spindle drills with articulated spindles
Internal thread cutting machines
Horizontal drilling and milling machines of bench and plate type

Sawing Machines

Circular sawing machines

Sheet-Metal Working Machines

Shears
Non-cutting cold moulding machines
Non-cutting moulding machines
Presses

Hot Moulding Machines

Injection Casting Machines for thermoplastic compositions

Hydraulic Presses

Pumps
Feed boards for grinding wheels
Controls

Wire Drawing Machines

Wire-Looms

Tools

Hand and Machine Tools of every description
Grinding materials
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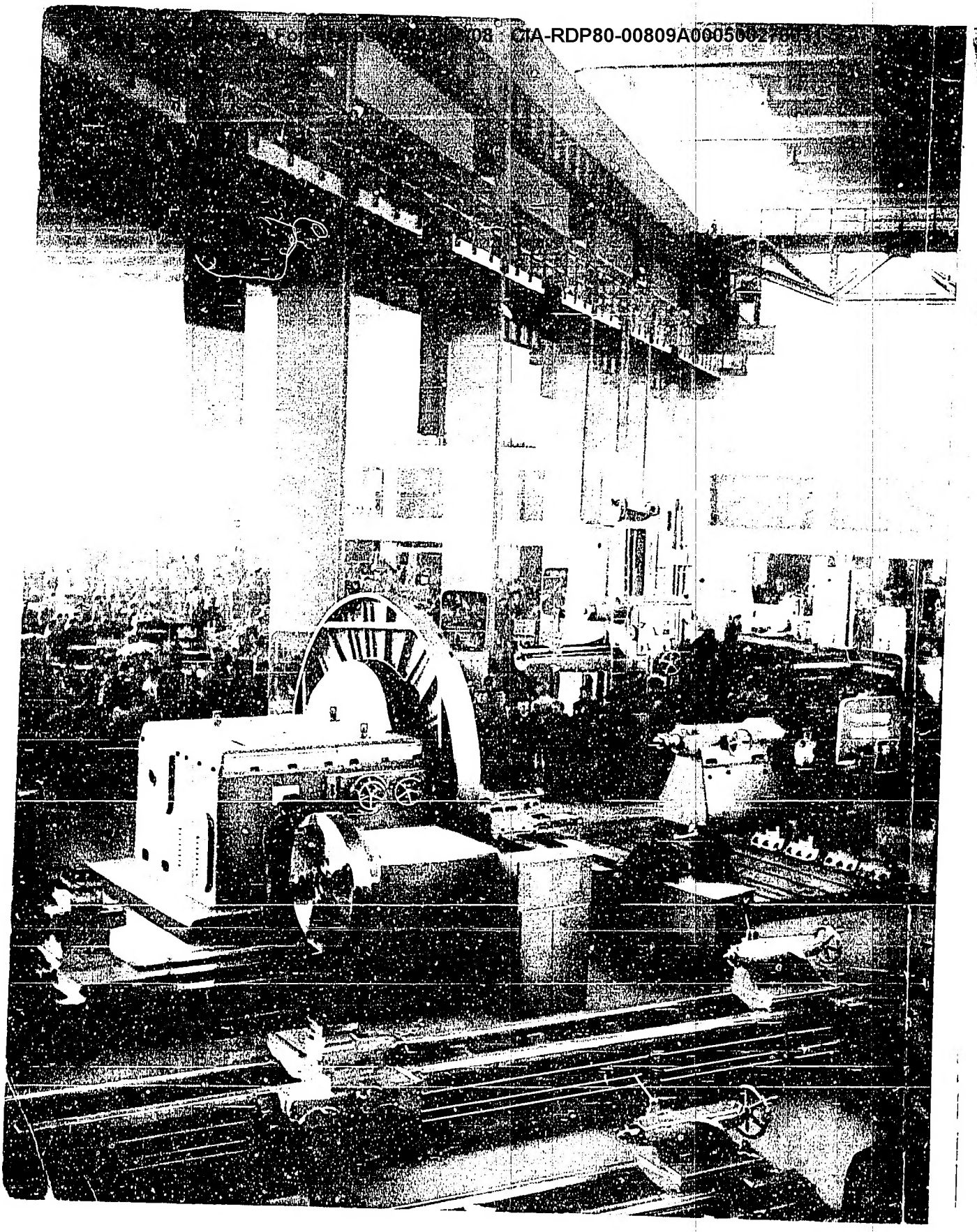

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